OKIDATA®

Service Manual

ML520 // ML521
Dot Matrix Printers

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1.1.01 General Information

The Microline 520 and Microline 521 are letter quality, nine-pin, dot-matrix printers which utilize *OKISMART* paper handling. Patented Okidata technology does away with the manual head gap adjustment. The printer actually reads and learns the print medium being used, then automatically adjusts the head gap to the optimum distance. This autogapping process leads to longer printhead life.

Options include the Bottom Feed Push Tractor, Cut-Sheet Feeder, Pull Tractor and Serial Interface Board.

The Microline 520 is an 80 column printer.
The Microline 521 is a 132 column printer.

Okidata's one year limited warranty covers the parts, labor and printhead on both printers.
The following items are available for the printer.

OKISMART Typer - software which provides the flexibility for the Microline 590/521 to function like a typewriter on checks, labels and envelopes.

OKISMART Panel - a utility program that lets you control selected printer functions from your personal computer.

Scalable Fonts - 14 scalable fonts, available on diskette.

NOTE:

The OkiSmart software includes three programs.

1. OkiSmart Control

2. OkiSmart Panel Emulator

3. OkiSmart Setup

Refer to the Printer Handbook for more information.

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1.2 PHYSICAL SPECIFICATIONS

1.2.01 Dimensions

NOTE:
Dimensions INCLUDE the platen knob, acoustic cover, and paper separator.

Microline 520
Width: 16.9 inches (43 centimeters)
Depth: 14.9 inches (37.8 centimeters)
Height: 6.5 inches (16.5 centimeters)

Microline 521
Width: 23 inches (58.4 centimeters)
Depth: 14.9 inches (37.8 centimeters)
Height: 6.5 inches (16.5 centimeters)

1.2.02 Printer Weight

Microline 520
17.6 pounds (8.0 kilograms)

Microline 521
23.1 pounds (10.5 kilograms)

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1.3 POWER REQUIREMENTS

1.3.01 Input Power
120 VAC: +5.5 / -15%
230/240 VAC: +10 / -14%

1.3.02 Power Consumption
Operating: 110 VA
Idle: 40 VA
Local Test: 70 VA

1.3.03 Power Frequency
120 VAC: 60 Hz +/- 2%
230/240 VAC: 50/60 Hz +/- 2%

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1.4 ENVIRONMENTAL CONDITIONS

1.4.01 Acoustic Rating

Near Letter Quality Mode

Microline 520 54.9 dBA

Microline 521 54.4 dBA

Utility Mode

Microline 520 57.2 dBA

Microline 521 56.9 dBA

Quiet Mode

Microline 520 52.5 dBA

Microline 521 52.3 dBA

1.4.01 Altitude

10,000 feet (3,050 meters)

1.4.03 Ambient Temperature and Relative Humidity (RH)

While operating: 41 to 104 degrees Fahrenheit (5 to 40 degrees Celsius)

Operating humidity: 20% to 80% RH

While in storage: 14 to 122 degrees Fahrenheit (- 10 to 50 degrees Celsius)

Storage humidity: 5% to 95% RH

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1.5 AGENCY APPROVALS

1.5.01 Listings

UL No: UL Standard No. 1950 D3

CSA No: CSA Standard 22.2-950 D3

FCC: FCC Certified per Part 15, Subject J, Class B

IEC: IEC 950

VDE: VDE 0805 VDE 0875 Class B

BS: BS 7002

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1.6 OPERATIONAL SPECIFICATIONS

1.6.01 Character Matrix Sizes

Table of Print Speed and Character Matrix

Mode	Near Letter Quality	Utility	High Speed Draft
Speed	80 (12cpi)	320 (12cpi)	427 (12cpi)
Matrix (H x V)	17 x 13	9 x 7	7 x 7

Print Speed at Different CPI for the ML 520/521

Mode	CPI	CPS	Horiz. DPI	Vert. DPI	IPS
HSD	10	427	90	72	42.7
	12	427	108	72	35.6
	15	427	135	72	28.5
	17.1	427	154	72	25.0
	20	427	180	72	21.4
Utility	10	320	120	72	32
	12	320	144	72	26.7
	15	320	180	72	21.3
	17.1	320	206	72	18.6
	20	320	240	72	16.0
LQ	10	80	240	144	16.0
	12	80	288	144	13.3
	15	80	360	144	13.3
	17.1	80	412	144	9.32
	20	80	480	144	8.0

1.6.02 Characters Per Line

Microline 520

Characters Per Line	Characters Per Inch
80	**10**
96	**12**
120	**15**
137	**17.1**
160	**20**

Microline 521

Characters Per Line	Characters Per Inch
136	**10**
163	**12**
204	**15**
233	**17.1**
272	**20**

1.6.03 Character Pitches
5, 6, 8.5, 10, 12, 15, 17.1, 20

1.6.04 Character Sets

Standard ASCII

EPSON Character Set I & II

IBM Character Set I, II & All Characters

Foreign Character Substitution

International Character Sets

Code Page 850, 860, 863, 865 and 437

Line Graphics

Bar Code

Code 39

UPC A

UPC E

EAN 8

EAN 13

Interleaved 2 of 5

Code 128 (A, B, C)

Postnet

1.6.05 Emulations

NOTE: *The emulations are co-resident*

Epson FX

IBM Proprinter

Microline Standard

1.6.06 Fonts

Near Letter Quality
Courier

Utility
Gothic

High Speed Draft
Gothic

Bar Code
Code 39
UPC A
UPC E
EAN 8
EAN 13
Interleaved 2 of 5
Code 128 (A, B, C)
Postnet

1.6.07 Front Panel Switches

SELECT / Menu Micro Feed Up / Down

Shift Paper Park

Line Feed Pitch Selection

FORM FEED / Load Print Quality Selection

Top of Form Tear

Quiet Reset

1.6.08 Graphics Resolution

Graphics Resolution: 288 (horizontal) x 144 (vertical) dots per inch (DPI) maximum

1.6.09 Interface

Standard
Centronics Parallel

Optional

RS232C Serial

1.6.10 Line Feed Increments

Fixed
6 lines per inch (lpi) [0.167 inch (4.23 millimeters)]
8 lines per inch (lpi) [0.125 inch (3.175 millimeters)]

Variable
n/60 inch
n/72 inch
n/144 inch
n/216 inch

1.6.11 Line Feed Time

65 milliseconds 6 lines per inch (lpi)

6 milliseconds 8 lines per inch (lpi)

1 second 5.0 inches (Continuous paper feed rate)

1.6.12 Menu Mode

Switch	Action
Paper park	**Prints the entire menu.**
Line Feed / Reverse	**Selects Group Function**
FORM FEED / Load	**Selects Item**
Tear	**Selects Item Value**
SEL / Menu	**Exits Menu Mode, Enters Select**

1.6.13 Paper Feed Methods

Standard
Friction Feed (Top)
Rear Push Tractor (Rear)

Optional
Pull Tractor (Bottom)
Bottom Push Tractor Feed (Bottom)
Single-Bin Cut Sheet Feeder (Top)
CSF 5000 - Narrow
CSF 5001 - Wide

1.6.14 Paper Feed Paths

Top Feed (Standard)

Rear Feed (Standard)

Bottom Feed (by using an Optional feed mechanism)

Special Features

Paper Park

Automatic Paper Loading

Forms Tear Off

1.6.15 Paper Loading

Auto Loading (Top Feed)

Press FORM FEED / Load switch to feed paper to default position

1.6.16 Paper Out Detection

Distance from end of paper

Rear Feed: 0.5 inches (12.7 mm)

Bottom Feed: 0.5 inches (12.7 mm)

Top Feed: 0.5 inches (12.7 mm)

1.6.17 Paper Tear Capabilities

Forms Tear-0ff (sharp edge on access cover)

Metal Tear Bar (with optional bottom feed tractor unit)

1.6.18 Print Method

Printhead Type

General Information

Impact: Dot Matrix

9 pin printhead

.0134 inch (0.34 millimeter) diameter pins

Overheat Protection

When printhead temperature exceeds 110 degrees Celsius, the printer stops bi-directional printing. Uni-directional printing begins.

If the temperature exceeds 118 degrees Celsius, printing stops.

Printing will resume when the printhead temperature drops below 118 degrees Celsius.

NOTE:
Refer to Section Two for more information on printhead operation.

Printhead Gap Information

Three items factor into printhead gap information:

1. Printhead Gap Adjustment

This is a SERVICE ADJUSTMENT made by a technician.

It is covered in Section 3.3 of this Service Handbook.

The Adjustment measures 0.014 +/- 0.001 inches 90.35, +/-0.03 mm).

2. Printhead Gap Adjustment

This is a MENU ITEM in the SET-UP Group.

It fine tunes the automatic setting of the printhead gap.

The settings are 0, 1 and -1.

Use 1 to darken print (if output is consistently light).

Use -1 to lighten print (if output is consistently dark).

3. Gap Control

This is a MENU ITEM in each (Paper Feed) Group.

The Groups are REAR FEED, BOTTOM FEED, and TOP FEED.

Gap Controls determines how the printhead gap is set.

The settings are listed below.

Auto Gap, Semi Auto Gap, 1, 2, 3, 4, 5, 6, 7, 8, 9

An explanation of each setting follows.

Auto Gap

This is the factory default.

Automatically determines paper thickness of the first page.

During single-sheet feed, each page's thickness is checked while a job is printing.

Semi Auto Gap

Similar to Auto Gap.

Automatically determines paper thickness of the first page.

During single-sheet feed, each page's thickness IS NOT checked "while" a job is printing.

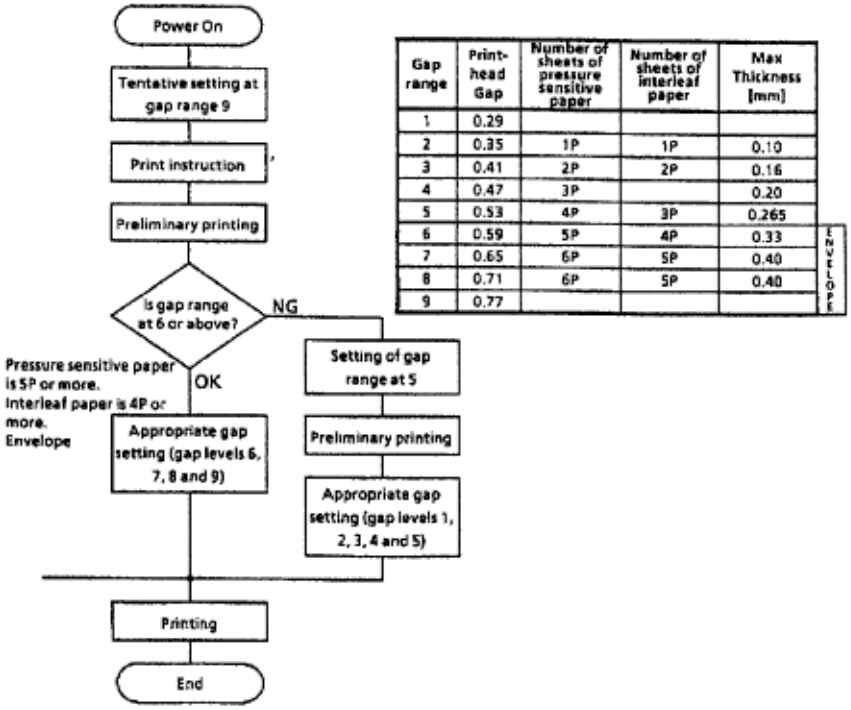
1, 2, 3, 4, 5, 6, 7, 8, 9

Used when the same paper is used ALL of the time.

Bypasses the automatic head gap adjustment.

1 is the narrowest head setting.

9 is the widest head setting.


Power On
Tentative setting at gap range 9
Print instruction
Preliminary printing
Is gap range at 6 or above?
NG
OK
Pressure sensitive paper is 5P or more.
Interleaf paper is 4P or more.
Envelope
Setting of gap range at 5
Preliminary printing
Appropriate gap setting (gap levels 1, 2, 3, 4 and 5)
Appropriate gap setting (gap levels 6, 7, 8 and 9)
Printing
End

Gap range	Print-head Gap	Number of sheets of pressure sensitive paper	Number of sheets of interleaf paper	Max Thickness [mm]	
1	0.29				
2	0.35	1P	1P	0.10	
3	0.41	2P	2P	0.16	
4	0.47	3P		0.20	
5	0.53	4P	3P	0.265	
6	0.59	5P	4P	0.33	ENVELOPE
7	0.65	6P	5P	0.40	
8	0.71	6P	5P	0.40	
9	0.77				

1.6.19 Print Modes

Near Letter Quality

Utility

High Speed Draft

1.6.20 Print Speed

Table of Print Speed and Character Matrix

Mode	Near Letter Quality	Utility	High Speed Draft
Speed	80 (12 cpi)	320 (12 cpi)	427 (12 cpi)
Matrix (H x V)	17 x 13	9 x 7	7 x 7

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1.7 PAPER SPECIFICATIONS

CAUTION:
Use Bottom Feed and/or optional Pull Tractor for card stock and labels.

1.7.01 Types

Card Stock

Weight: 120 lbs. (450 g/m 2) Maximum

Width: Microline 520 5 to 8 inches (12.7 to 20.3 centimeters)
Microline 521 5 to 14 inches (12.7 to 35.6 centimeters)

Length: 3 to 17 inches (7.62 to 43.18 centimeters)

Thickness: .017 inches (0.44 millimeters)

Paper Feed Path: Bottom

Printhead Gap Information: **Refer to the Printhead Gap Information, Section 1.6**

Continuous Form

Weight:

Single Part 12 - 24 lb. (45 to 90 g/m 2)

Multi-Part, Carbonless 9 - 11 lb. (35 to 40 g/m 2)

Multi-Part, Interleaf Paper 10 - 12 lb. (38 to 45 g/m 2) Carbon 9 lb. (35 g/m 2)

Width: Microline 520 3.5 to 10.5 inches (8.8 to 26.6 centimeters)

Microline 521 3.5 to 16.5 inches (8.8 to 41.9 centimeters)

Length: 3 to 17 inches (7.62 to 43.18 centimeters)

Thickness: 0.014 inches (0.36 millimeters) Rear Feed 0.017 inches (0.44 millimeters) Bottom Feed

Paper Feed Path: Rear or Bottom

Printhead Gap Information: **Refer to the Printhead Gap Information, Section 1.6**

Cut Sheet

Weight: 12 to 24 lbs. (45 to 90 g/m 2)

Width: 7.2 to 14.3 inches (18.3 to 36.3 centimeters)

Width: Microline 520 7.2 to 8.5 inches (18.2 to 21.5 centimeters)

Microline 521 7.2 to 14.3 inches (18.2 to 36.3 centimeters)

Length: 3 to 17 inches (7.62 to 43.18 centimeters)

Thickness: 0.014 inches (0.325 millimeters) Maximum

Paper Feed Path: Top

Printhead Gap Information: **Refer to the Printhead Gap Information, Section 1.6.**

Envelopes

Weight: 24 lbs. (90 g/m 2) Maximum

Size:

Single Feed

Minimum: 6.5 x 3.6 inches (16.5 x 9.1 centimeters)

Maximum: 9.5 x 4.1 inches (24.1 x 10.4 centimeters)

Continuous

Non-overlap type

Thickness: .014 inches (.325 millimeters) Maximum

Paper Feed Path: Bottom

Printhead Gap Information: **Refer to the Printhead Gap Information, Section 1.6.**

Labels

Weight: N/A

Width: Microline 520 3.5 to 10.5 inches (8.8 to 26.6 centimeters)
Microline 521 3.5 to 16.5 inches (8.8 to 41.9 centimeters)

Length: 3 to 17 inches (7.62 to 43.18 centimeters)

Thickness: .011 inches (0.28 mm) Maximum (including backing)

Paper Feed Path: Bottom

Printhead Gap Information: **Refer to the Printhead Gap Information, Section 1.6.**

CAUTION:
Use Bottom Feed and/or optional Pull Tractor for card stock and labels.

Transparency

NOTE:
Roller marks may mar the transparency under high temperature / high humidity conditions.

Weight: 12 to 24 lbs. (45 to 90 g/m 2)

Width: Microline 520 7.2 to 8.5 inches (18.2 to 21.5 centimeters)
Microline 521 7.2 to 14.3 inches (18.2 to 36.3 centimeters)

Length: 3 to 17 inches (7.62 to 43.18 centimeters)

Thickness: 0.14 inches (0.36 millimeters)

Paper Feed Path: Top

Printhead Gap Information: **Refer to the Printhead Gap Information, Section 1.6.**

1.7.02 Length

NOTE:
The recommended length is specific to paper type.

Rear Feed

Minimum 3 inches (7.62 centimeters)

Maximum 17 inches (43.18 centimeters)

Bottom Feed

Minimum 3 inches (7.62 centimeters)

Maximum 17 inches (43.18 centimeters)

Top Feed

Minimum 3 inches (7.62 centimeters)

Maximum 17 inches (43.18 centimeters)

1.7.03 Number of Copies

Original + 4 Interleaf

Original + 4 Carbonless

Original Cut Sheet

1.7.04 Thickness

0.014 inches / 0.36 mm Maximum Thickness, Rear Feed

0.017 inches / 0.44 mm Maximum Thickness, Bottom Feed

1.7.05 Weight

NOTE:
The recommended weight is specific to paper type.

Minimum: 9 lb. (35 g/m 2)

Maximum: 120 lb. (90 g/m 2)

1.7.06 Width

NOTE:
The recommended width is specific to paper type.

Paper

Microline 520

Minimum: 3.5 inches (8.8 centimeters)

Maximum: 10.5 inches (26.6 centimeters)

Microline 521

Minimum: 3.5 inches (8.8 centimeters)

Maximum: 16.5 inches (41.9 centimeters)

Printing Area

Microline 520 8 inches Maximum

Microline 521 13.6 inches Maximum

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1.8 MEMORY SPECIFICATIONS

1.8.01 EEPROM

1 Kbit serial EEPROM (used to store Menu data)

1.8.02 EPROM

1 MBit EPROM (Printer Control Program - Fonts)

1.8.03 RAM

128 Kbyte Total Resident RAM

Used as

Receive Buffer

Receive Buffer Size is selected through the Menu.

Settings are: 64 K, 32 K, 1 line

Print Buffer

DLL Buffer

Scratch Pad

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1.9 CONSUMABLES

1.9.01 Ribbon

CAUTION:
Using a non-Okidata ribbon may damage the printhead and void any warranties.

Material

Nylon fabric, cartridge type, re-inking

Type

Black Ribbon

Life (On average, at 10 characters per inch, Utility Mode)

4 million characters

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1.10 OPTIONS - Cut Sheet Feeders

1.10.01 Cut Sheet Feeders

Single Bin

The CSF-5000 is a narrow feeder for the Microline 520.

Single Bin with envelope capability

Paper Width: 7.2" to 8.5" (18.3 cm to 36.3 cm)

Paper Length: 10.1" to 14" (25.6 cm to 35.6 cm)

Capacity: 170 sheets (16 lb.), 100 sheets (20 lb.)

The CSF-5001 is a wide feeder for the Microline 521.

Single Bin with envelope capability

Paper Width: 7.2" to 14.3" (18.3 cm to 36.3 cm)

Paper Length: 10.1" to 14" (25.6 cm to 35.6 cm)

Capacity: 170 sheets (16 lb.), 100 sheets (20 lb.)

Dual Bin

P/N 70022601 is a narrow feeder for the Microline 520.

Dual Bin with envelope capability

Paper Width: 7.2" to 8.5" (18.3 cm to 36.3 cm)

Paper Length: 10.1" to 14" (25.6 cm to 35.6 cm)

Capacity: 170 sheets (16 lb.), 100 sheets (20 lb.)

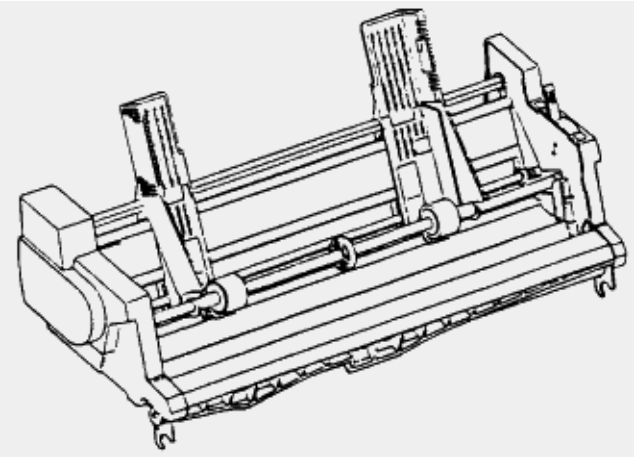
P/N 70022801 is a wide feeder for the Microline 521.

Dual Bin with envelope capability

Paper Width: 7.2" to 14.3" (18.3 cm to 36.3 cm)

Paper Length: 10.1" to 14" (25.6 cm to 35.6 cm)

Capacity: 170 sheets (16 lb.), 100 sheets (20 lb.)



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1.10.02 Pull Tractor Kit

NOTE:

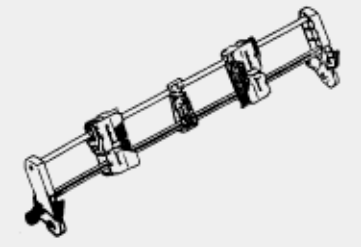
The Pull Tractor Kit (P/N 70023001) is a narrow feeder for the Microline 520.

The Pull Tractor Kit (P/N 70023201) is a wide feeder for the Microline 521.

Bottom Feed

Rear Feed (For Push/Pull Operation)

Paper Types: Continuous Feed and Labels



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1.10.04 Bottom Push Tractor Kit

NOTE:

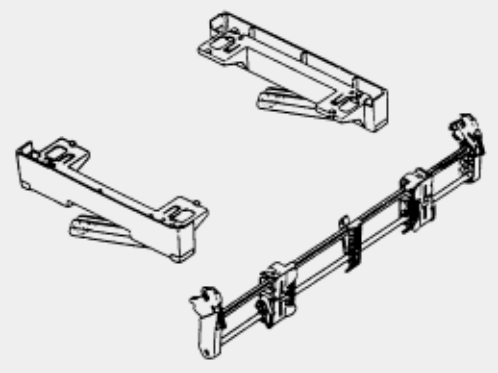
The Bottom Push Tractor Kit (P/N 70022901) is a narrow feeder for the Microline 520.

The Bottom Push Tractor Kit (P/N 70023101) is a wide feeder for the Microline 521.

Bottom Feed

Paper Type: Continuous Feed

Includes: Stand and Metal Tear Bar



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1.10.05 Serial Interface

Super-Speed 19.2K RS-232C

Ready/Busy/X-On/X-Off Protocols

Can be configured through the Menu or OKISmart Utility Program

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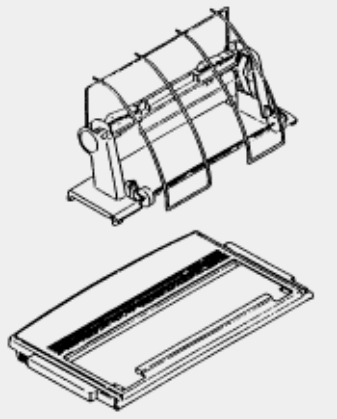
1.10.06 Roll Paper Stand

Adapts printer for use with roll-type paper (Model 520 only)

Includes: Stand, Support, Cord and DIN plug for connection to printer



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1.10.08 OKISmart Typer Utility

Obtained via BRC (Business Reply Card) packaged with printer

Includes: Typewriter Mode, Form Creation Utility and Barcode Utility

1.10.09 OKISmart Panel Utility

Obtained via BRC (Business Reply Card) packaged with printer

Includes: Front Panel Control Utility and Drivers for Windows 3.0 & 3.1

NOTE:
The OKISmart software includes three programs.

1. OKISmart Control

2. OKISmart Panel Emulator

3. OKISmart Setup

Refer to the Printer Handbook for more information.

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1.11 RELIABILITY

1.11.01 Mean Time Before Failure (MTBF)

Approximately 6,000 hours: 25% duty cycle / 35% page density

1.11.02 Mean Time To Repair (MTTR)

Approximately 15 minutes to major sub-assembly level

1.11.03 Printer Life

Approximately 16,000 hours of power-on time: 25% duty cycle / 35% page density

1.11.04 Printhead Life

Average 200 million characters in 10 cpi utility mode @ normal 25% duty, 35% page density

1.11.05 Ribbon Life

Approximately 4 million characters

1.11.06 Warranty (Limited)

One year, parts and labor

1.11.07 Service

Authorized OKIDATA Service Centers

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2.1 ELECTRICAL OPERATION

The printer is comprised of the electrical components listed below.

- Main Control Board
- Power Supply Assembly
  - Transformer
  - Filter Board
- Operator Panel
- Space Motor / Line Feed Motor
- Printhead

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2.1.01 Main Control Board

The main control board is made up of the microprocessor, peripheral circuits, drive circuits, sensors and interface connectors.

The power to the main control board is supplied by the transformer assembly through a wire harness. The power to other electrical parts (line feed motor, space motor and printhead) is provided by the power supply circuitry through connectors on the main control board.

Microprocessor (MPU) (Location 04C: 67X640)

16 bit MPU, using CMOS technology.

The MPU contains a 20 bit address bus, a 16 bit data bus.

The MPU can access 1 Mbyte of program memory and 1 Mbyte of data memory space.

The microprocessor controls the entire printer by executing the control program through the LSIs and the driver circuits.

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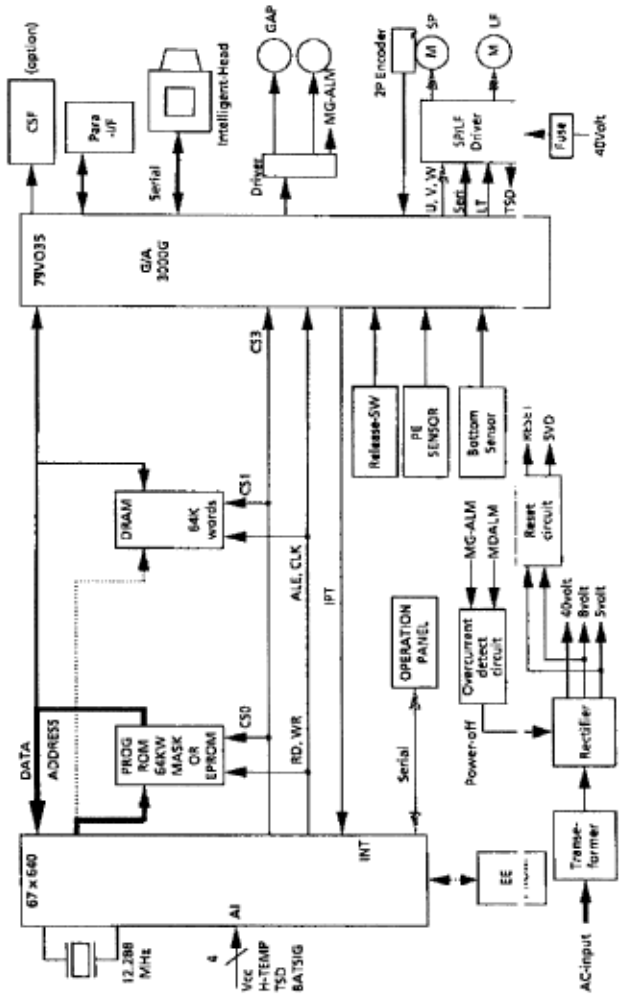
Block Diagram



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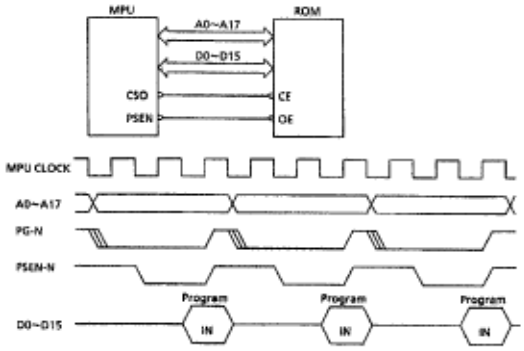
Program ROM

Location 05CA: 27C1024

This 64k x 16 bit (1Mbit) EPROM contains the control program for the printer. The MPU executes the instructions contained in this program.

The Program ROM is assigned to the program memory area of the MPU and instructions are fetched by the PSEN signal of the MPU.



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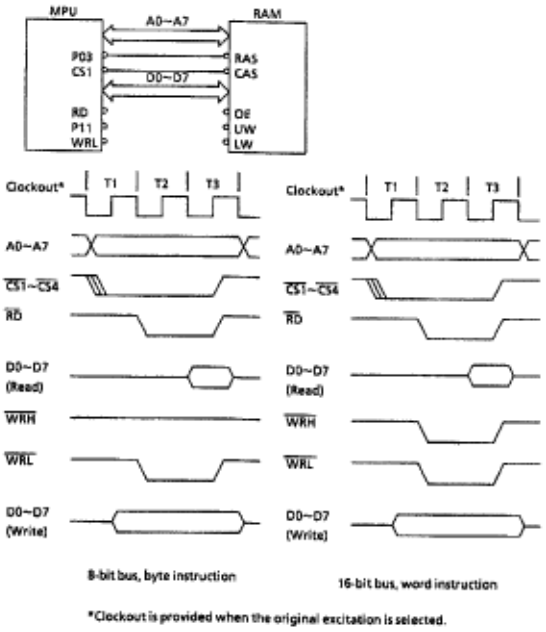
RAM

Location 05CB: 511664Z

The RAM is CMOS dynamic RAM with 65,536 words x 16-bit configuration. It is used as a receive buffer, print buffer and work buffer.



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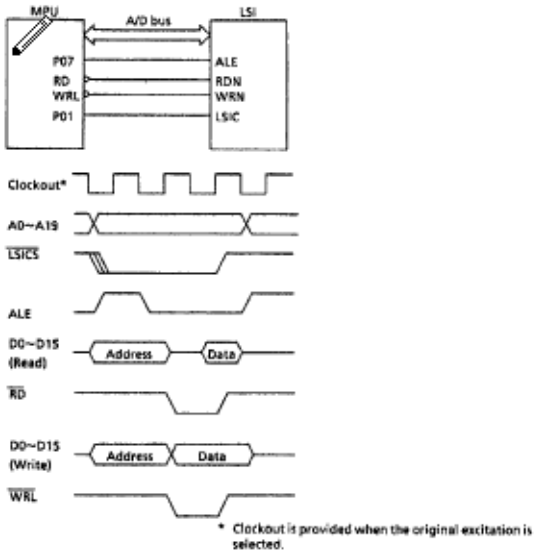
LSI

Location 04B: MSM79VO35

Detects the output of the two-phase sensor on the DC space motor to control the motor drive phase.

Transmits and receives serial data to and from the printhead based on the dot timing (which is derived from the space motor speed).

Controls the external interface. The LSI is connected to the MPU.



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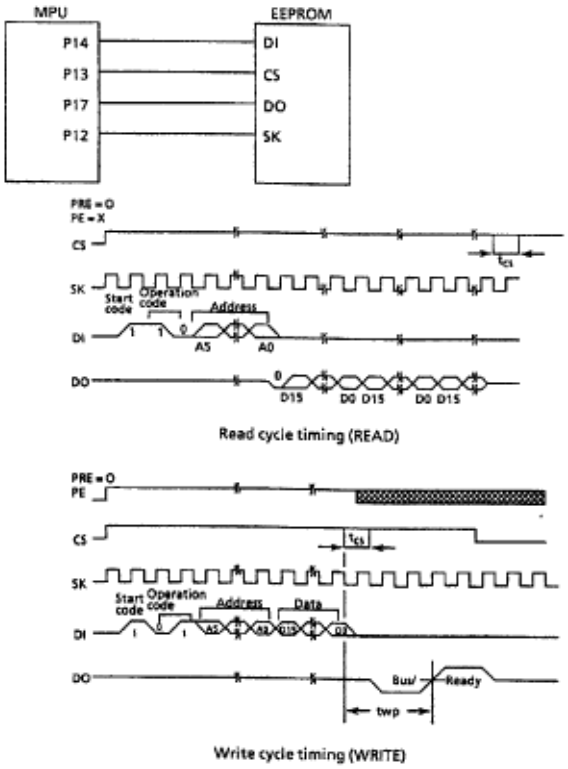
Electrically Erasable Programmable Read Only Memory (EEPROM)

(Location 03C: 93CS46)

The EEPROM is a CMOS serial I/O type memory (EEPROM). It is capable of electrically erasing and writing 1,024 bits.

The EEPROM contains the menu data and the head drive time correction data.



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2.1.02 Initialization

This printer is initialized when the printer is powered on or when the I-PRIME-N signal is input from the host via the parallel interface.

The steps in Printer Initialization are listed below.

The RST-N signal is output from the reset circuit to reset the MPU and LSIs.

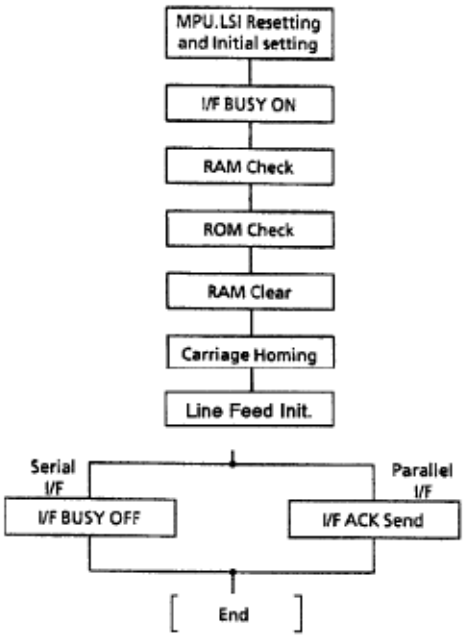
The program is executed and the LSIs are reset by the MPU via IORST-N.

NOTE:

A reset operation initiated by I-PRIME does not reset the MPU.

The program sets the LSI (02D) mode, checks the memory (ROM/RAM), then executes carriage homing and determines the phase of the line feed motor.

Finally, the program establishes the interface signals (P-I/F: ACK-P signal sending, and S-I/F: BUSY-N signal off) and lights the SELECT lamp to indicate that the printer is in the ON-LINE state.



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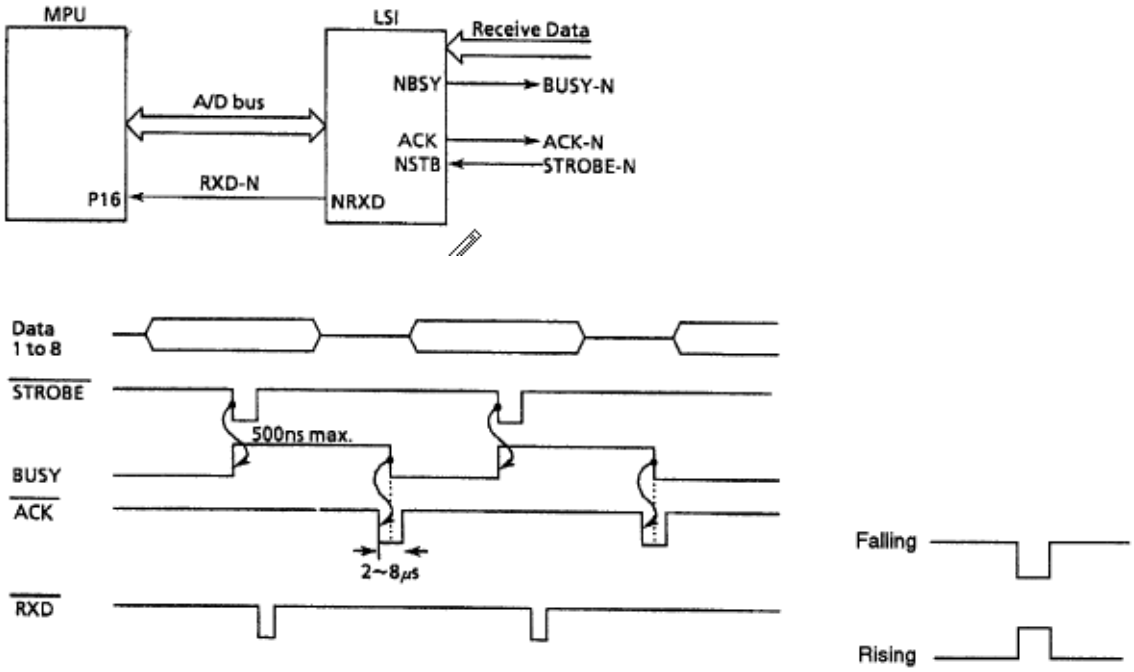
2.1.03 Parallel Interface Control

The parallel data input from the host to the interface LSI is latched to the internal register at the falling edge of the STROBE-N signal.

The LSI sets the BUSY-N signal to inform the host that the data is being processed. The LSI also outputs the RXD-N signal to inform the MPU of data reception. The data is read upon receiving the RD-N signal from the MPU.

When the data processing is complete, the BUSY-N signal is disabled and the ACK-N signal is sent to request the next data. When the buffer is full and reception is not desired, the BUSY signal is sent to request data transmission be stopped.



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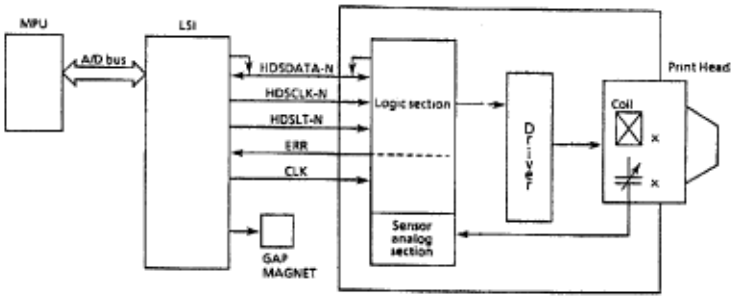
2.1.04 Print Control

The print data is transmitted as serial data from the LSI to the control circuit and the driver contained in the printhead.

After the data is printed, the sensor analog circuit controlling each pin returns the pin stroke data to the MPU. The MPU will make an automatic head gap adjustment. This feedback system sets the optimum drive time for each pin in order to maintain high print quality.

In the case of envelopes, where the medium thickness varies as the printhead moves along the platen, the strike force of the pins changes to compensate for the differences in thickness.



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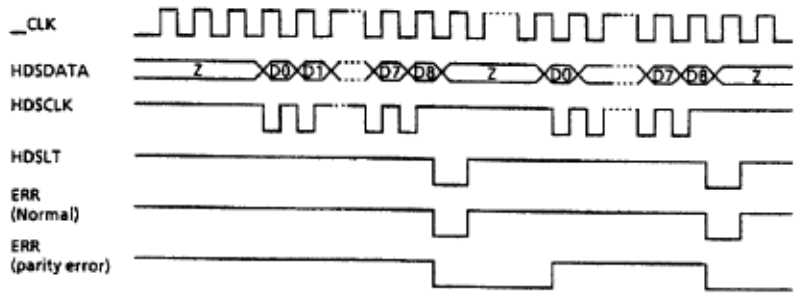
LSI/Printhead Interface

The connection between the LSI and the printhead is made with the bi-directional serial data bus. The LSI transmits the print data as serial data to the logic circuit of the printhead. The printhead returns serial data from the printhead sensor analog circuit to the LSI. This information is used to determine the optimum drive time for the next print request.

The logic circuit of the printhead signals the LSI if a parity error is detected in the print data.



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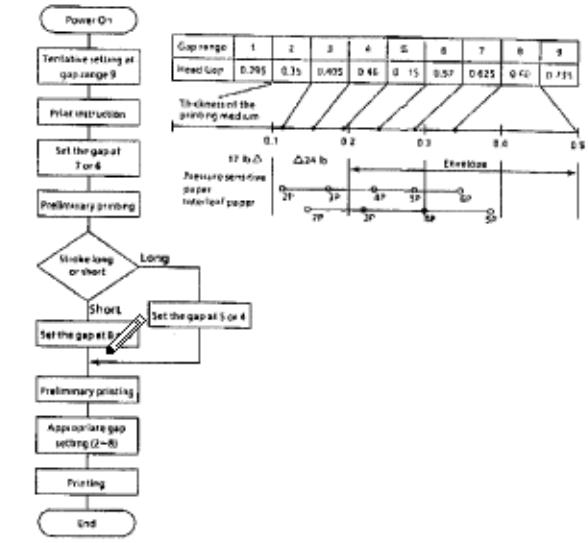
Gap Adjust Control

The Gap Adjust LSI receives stroke length information for all of the printhead pins from the sensor analog circuit. The Gap Adjust LSI then sets the optimum printhead gap for the printing medium.

NOTE:
Refer to Section 2.2.03 for a description of the mechanical process.

All values in the below chart are in millimeters



b. Auto Gap and Fixed Gap Adjust Control

Gap range	1~3	4~6	7~9
Print Speed	High (100%)	Med (85%)	Low (50%)

As shown in the table left, three print speeds are available according to the thickness of the printing medium

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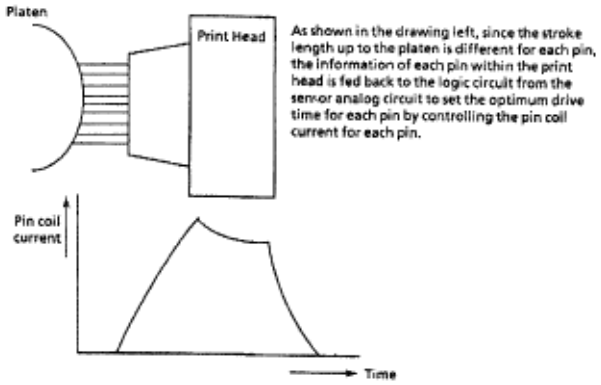
Print Compensation Control

The printhead compensates for the shape of the platen as shown below.

NOTE:
Also refer to Section 2.1.07 - Head Drive Time


Platen
Print Head
As shown in the drawing left, since the stroke length up to the platen is different for each pin, the information of each pin within the print head is fed back to the logic circuit from the sensor analog circuit to set the optimum drive time for each pin by controlling the pin coil current for each pin.
Pin coil current
Time

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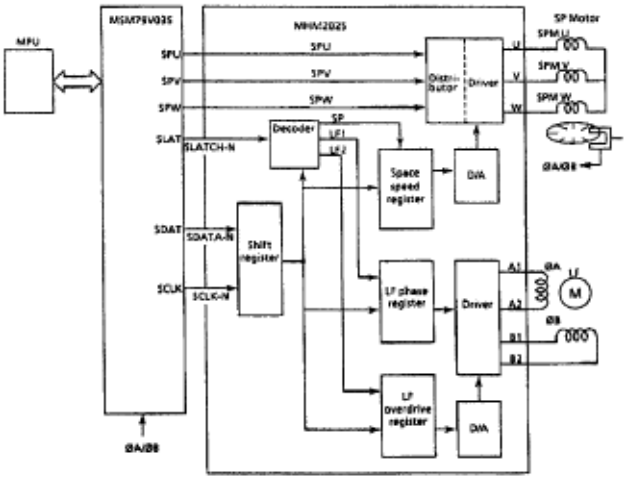
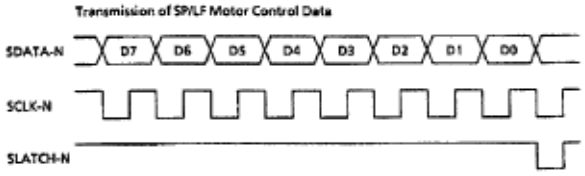
2.1.05 Space and Line Feed (SP/LF) Motor Control

The LSI (Location 04B: MSM79V035) generates the space motor and the line feed motor control signals according to commands received from the MPU. These signals are sent to the SP/LF motor driver.





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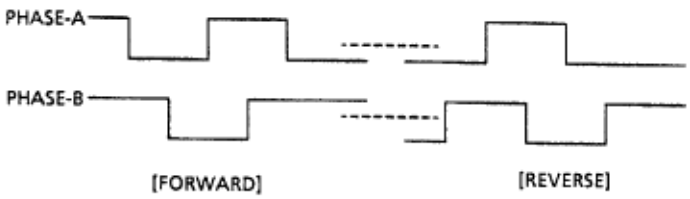
Line Feed Motor Control

The SP/LF motor driver (Location 5A: MHM2025) drives the line feed motor in two-phase bipolar, based on the phase changeover data output from the LSI.

The serial data from the LSI (04B: MSM79V035) is processed by a register contained in the SP/LF motor driver to measure the overdrive time and to change the phase.



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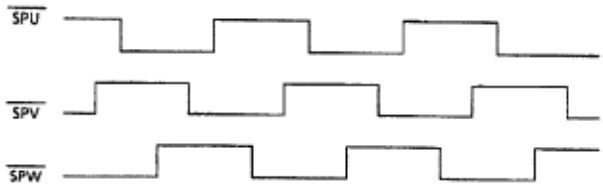
Space Motor Control

The SP/LF motor driver (Location 5A: MHM2025) drives the three-phase brushless motor. Motor movement is based on the phase signal (SPU, SPV and SPW) and the speed instruction data from the LSI. The MPU can identify the current speed of the space motor by measuring the pulse width of the output (Phase A, Phase B) of the encoder disk sensor.

After comparing the target speed for each print mode with the actual speed, the motor is accelerated or decelerated to maintain the desired speed for each print mode.



SP truth table

HALL AMP INPUT			OUTPUT		
SPU	SPV	SPW	U	V	W
H	H	L	OPEN	L	H
H	L	L	L	OPEN	H
H	L	H	L	H	OPEN
L	L	H	OPEN	H	L
L	H	H	H	OPEN	L
L	H	L	H	L	OPEN

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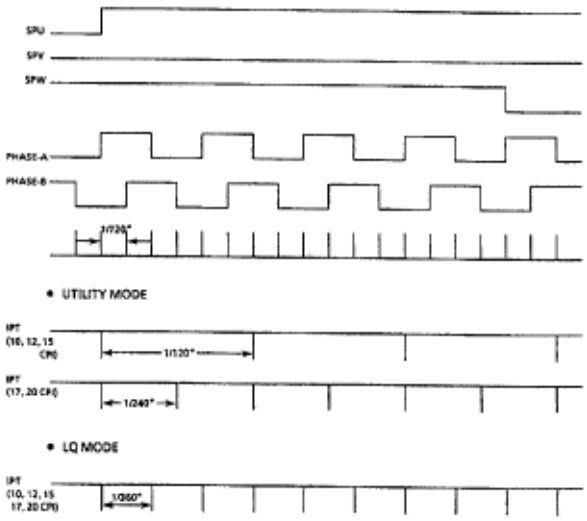
Encoder Disk

As the space motor operates, the encoder disk spins. When the encoder disk interrupts the photo sensors, the signals Phase A and Phase B are generated. The LSI (Location 04B: MSM79V035) divides these edge pulse signals (the frequency division is based on the selected print pitch) to generate the signal IPT. The IPT signal provides dot-on timing and carriage position detection timing.



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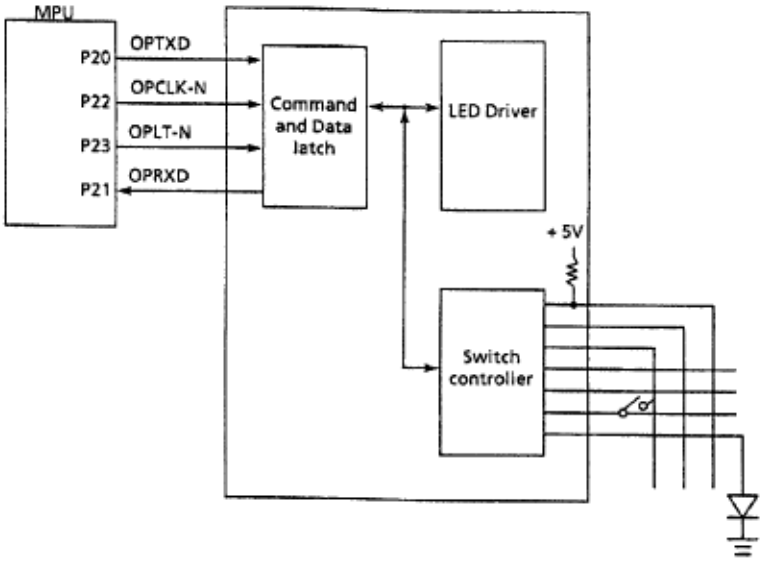
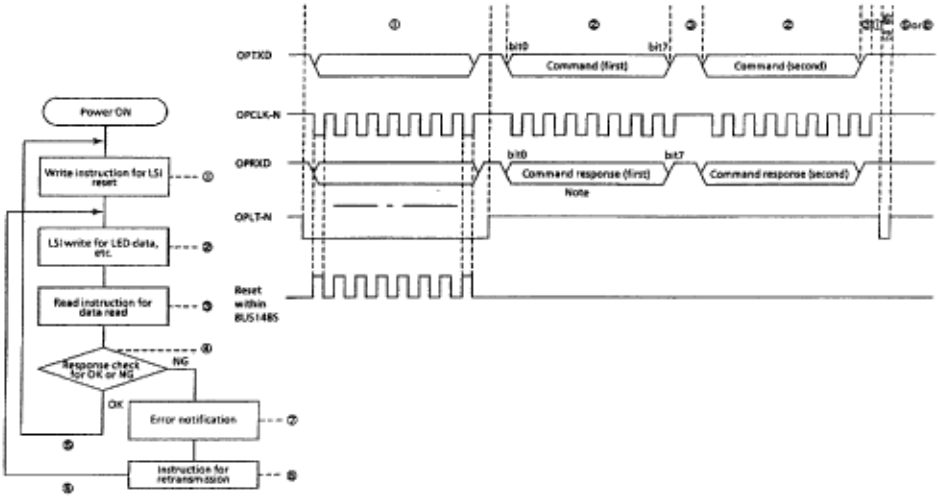
2.1.06 Operation Panel

The Serial I/O Port (Ports 20 - 23) of the MPU reads the operation panel switch data from the operation panel control LSI (Location IC1: BUS148S).

A two byte (15 bits +1 parity bit (even parity)) command (OPTXD) is transmitted from the MPU to the operation panel LSI in synchronization with the OPCLK signal. Once the LSI decodes the command, the command must pass a command code check and have no parity errors. Then, the specified I/O control will return the two byte command response to the MPU.





Note : From the illustration above, you can see that the command and the command response are output at the same time. This is because the bit 0 to bit 3 of OPRXD are fixed so that the response can be returned before decoding the command.

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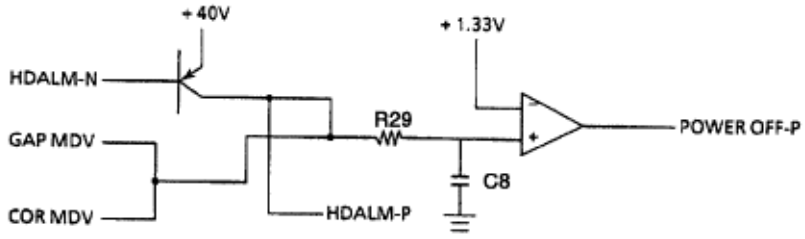
2.1.07 Alarm Circuit

Driver Circuit Alarm Processing

The printhead driver output and the head gap magnet output drive signals are monitored at R29 and C8. The POWER OFF-P signal is output by the comparator (Location 02C: IC2901) when driven for more than the specified time. This signal becomes the ALM signal. The ALM signal is sent to the power supply board and causes the DC voltages to be turned off.



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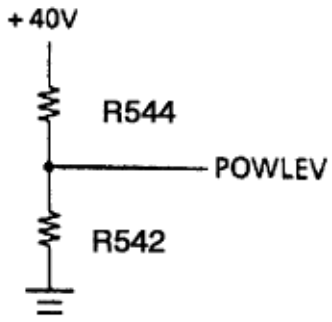
Low Motor Drive Voltage Alarm

+40V is converted into the POWLEV signal (0 vdc to +5 vdc) by the voltage divider network of R542 and R544, then input to the A/D port of the MPU. The value of this voltage is used to control the drive time and the print speed (pass number) of the head.



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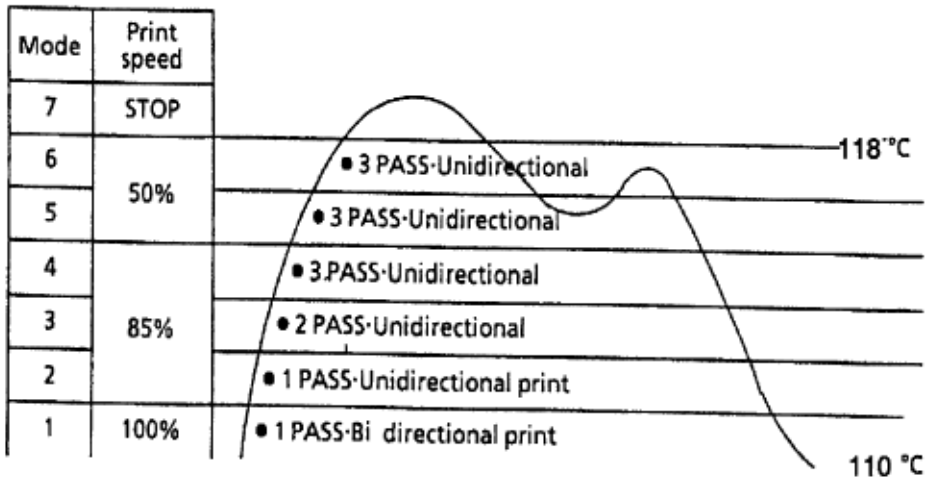
Head Drive Time

The head drive time is modified to compensate for the amount of the voltage drop of the POWLEV signal. By monitoring the voltage drop every 500 microseconds, the MPU is able to control and maintain the impact necessary for each printhead pin.



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Print Speed

Actual Voltage (+40 vdc)	Passes Required	Relative Print Speed
+34 vdc or greater	1	100%
+32 vdc to +34 vdc	1	Approximately 85%
+30 vdc to +32 vdc	1	Approximately 50%
+30 vdc or less	2	Less than 50%

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Head Overheat Alarm Processing

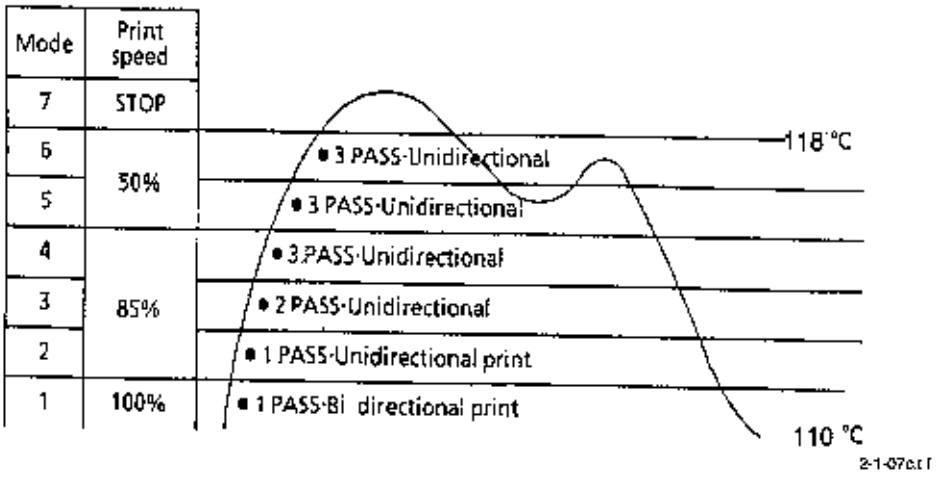
If the printhead temperature exceeds 110 degrees Celsius, the printer will switch to uni-directional print. If the temperature exceeds 118 degrees Celsius, printing will stop. Once the printhead cools, printing will resume.

Two thermistors are used to monitor the printhead temperature. One is contained in the printhead. The other is in the printhead driver.

A thermistor in the printhead prevents over-heating of the coil during periods of continuous bi-directional printing. If the temperature of the coil exceeds the pre-determined limits, the control circuit detects the thermistor signal (TSD).

Another thermistor monitors the temperature of the printhead driver. If the temperature of the driver exceeds the pre-determined limits, the control circuit detects the thermistor signal (TSD).

The voltage of the TSD signal is monitored at the MPU A/D port to control the pass number and print method (uni-directional / bi-directional) at each of seven levels.



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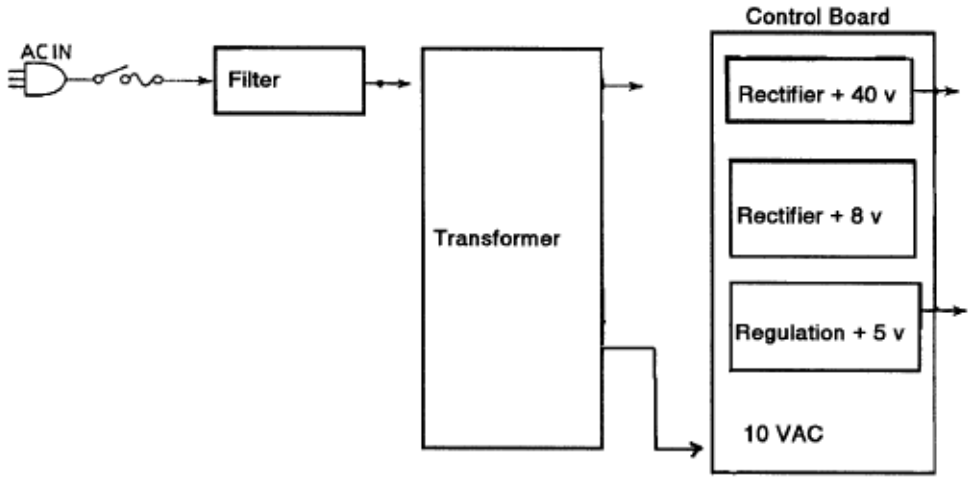
2.1.08 Power Supply Circuit

The switching type power supply circuit supplies the +5 vdc, +/-8 vdc, 10 VAC and +40 vdc.

Voltage/Signal	Purpose
+5 vdc	IC logic levels, LED drive voltages
+8 vdc	Serial interface line voltage, comparator IC
+10 VAC	Serial interface line voltage and the printhead analog circuit
+40 vdc	Printhead, space motor and line feed motor drive voltage



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2.2 MECHANICAL OPERATION

2.2.01 Printhead Mechanism

The printhead is a spring-charged, 9-pin printhead. It is attached to the carriage, which moves parallel to the platen. Electrically, the printhead is controlled by the main control board via the carriage cable and the space motor.

The printhead is composed of the following parts.

Wire Guide

Spring Assembly

Wire, Armature, Spring, Yoke, Spacer

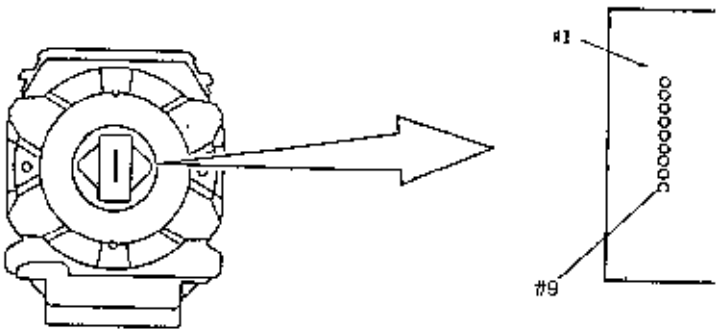
Magnet Assembly

Magnet, Core, Coil, Yoke

Printed Circuit Board

Logic Control, Print Driver, Analog Sensor Control and Thermistor

Cooling Fin



Arrangement of the head pins
View from the tip of the printhead

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Printhead Gap Information

Three items factor into printhead gap information.

1. Printhead Gap Adjustment

   This is a SERVICE ADJUSTMENT made by a technician.

   It is covered in Section 3.3 of this Service Handbook.

   The Adjustment measures 0.014, +/- 0.001 inches (0.35, +/- 0.03 mm).

2. Printhead Gap Adjust

   This is a MENU ITEM in the SET-UP Group.

   It fine tunes the automatic setting of the printhead gap.

   The settings are 0, 1, and -1.

   0 is the factory default.

   Use 1 to *darken* print (if output is *consistently light*).

   Use - 1 to *lighten* print (if output is *consistently dark*).

3. Gap Control

   This is a MENU ITEM in *each* [Paper Feed] Group.

   The Groups are REAR FEED, BOTTOM FEED, and TOP FEED.

   Gap Control determines how the printhead gap is set.

   The settings are listed below.

   Auto Gap, Semi Auto Gap, 1, 2, 3, 4, 5, 6, 7, 8, 9

   An explanation of each setting follows.

Auto Gap

   This is the factory default.

   Automatically determines paper thickness of the first page.

   During single-sheet feed, each pages thickness is checked *while* a job is printing.

Semi Auto Gap

Similar to Auto Gap.

Automatically determines paper thickness of the first page.

During single-sheet feed, each pages thickness IS NOT checked while a job is printing.

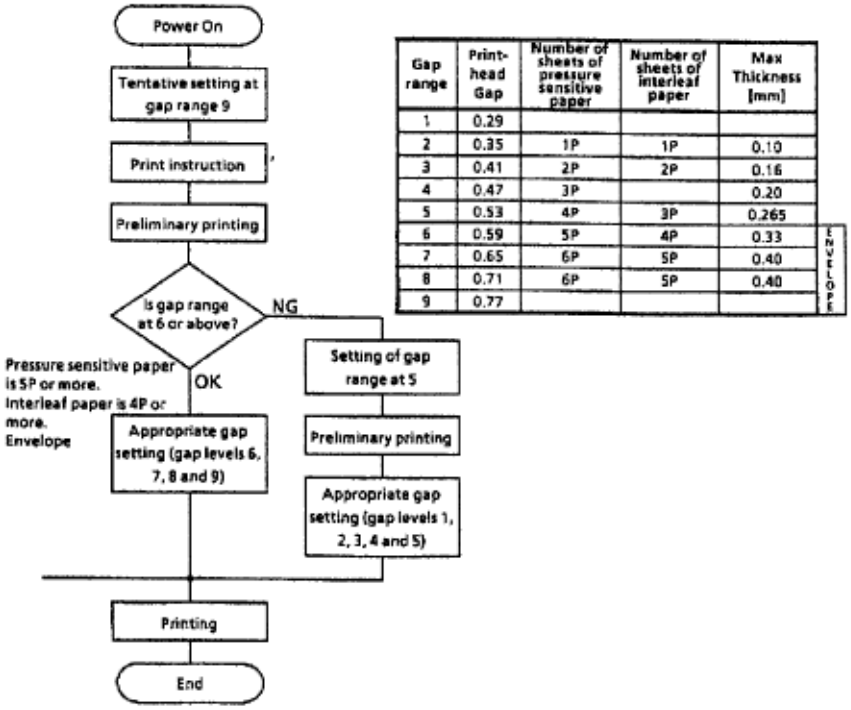
1, 2, 3, 4, 5, 6, 7, 8, 9

Used when the same paper is used ALL of the time.

Bypasses the automatic head gap adjustment.

1 is the narrowest gap setting.

9 is the widest gap setting.


Power On
Tentative setting at gap range 9
Print instruction
Preliminary printing
Is gap range at 6 or above?
NG
OK
Pressure sensitive paper is 5P or more. Interleaf paper is 4P or more. Envelope
Setting of gap range at 5
Preliminary printing
Appropriate gap setting (gap levels 1, 2, 3, 4 and 5)
Appropriate gap setting (gap levels 6, 7, 8 and 9)
Printing
End

Gap range	Print-head Gap	Number of sheets of pressure sensitive paper	Number of sheets of interleaf paper	Max Thickness [mm]	
1	0.29				
2	0.35	1P	1P	0.10	
3	0.41	2P	2P	0.16	
4	0.47	3P		0.20	
5	0.53	4P	3P	0.265	
6	0.59	5P	4P	0.33	ENVELOPE
7	0.65	6P	5P	0.40	
8	0.71	6P	5P	0.40	
9	0.77				

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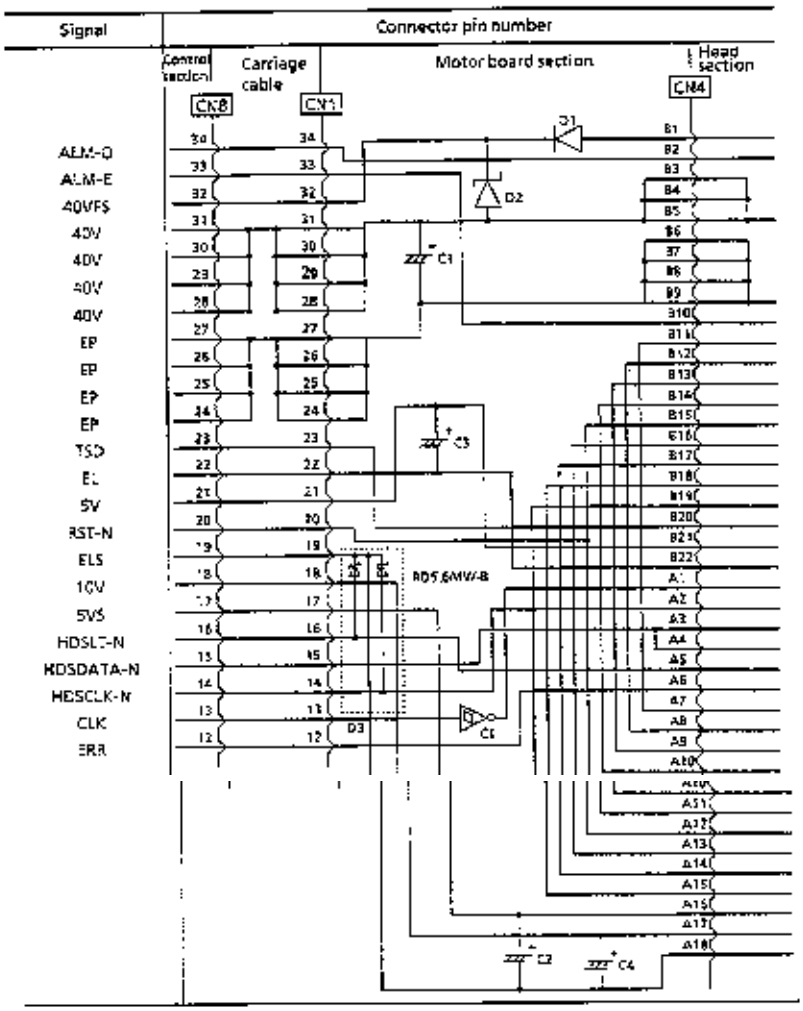
Interconnect Diagram: Control Board to Printhead

NOTE:

The printhead coil resistance values ARE NOT LISTED.

The individual printwire control lines CANNOT be accessed on this printhead.



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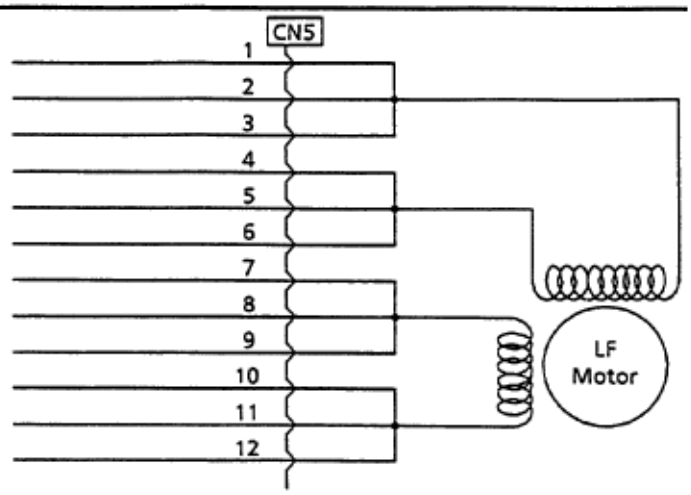
Line Feed Motor Resistance

The resistance of each coil should be approximately 13 ohms.

Pin number of LF Motor	Signal	Connector pin number
1	LF1	
2	LF1	
3	LF1	
4	LF2	
5	LF2	
6	LF2	
7	LF3	
8	LF3	
9	LF3	
10	LF4	
11	LF4	
12	LF4	



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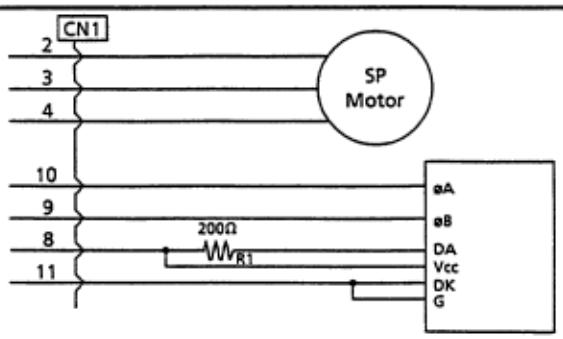
Space Motor Resistance

The resistance of each coil should be approximately 5 ohms.

Pin number of SP Motor	Signal	Connector pin number
2	SP-U	
3	SP-V	
4	SP-W	
10	PHASE-A	
9	PHASE-B	
8	+ 5V	
11	EL	

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Printhead Operation

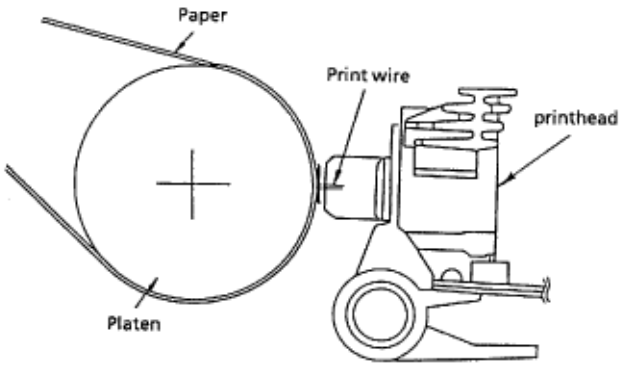
When the printhead is idle, the armature is attracted to the permanent magnet. The print wires, which are attached to each armature, are then concealed inside the wire guide.

When a signal to print a character is received, current flows through a coil. The magnetic field generated by the coil opposes the magnetic field between the armature and the permanent magnet. The armature is then driven in the direction of the platen by the force of the armature spring. The print wire (which is attached to the armature) protrudes from the tip of the wire guide and strikes the paper through the ribbon. This prints a dot on the paper.

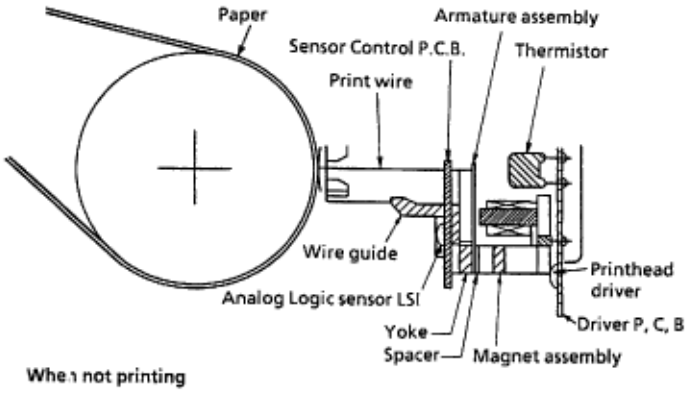
As the armature gets closer to the electrode of the analog sensor, the capacitance between them increases and a small amount of current flows. This current is amplified and sent to the logic control LSI to indicate armature activity. In order to attain optimum drive time, this information is transferred to the MPU. The MPU continually modifies the head gap to maintain the optimum drive time condition.

The analog sensor element monitors all of the pins. The difference in pin stroke due to the curvature of the platen is compensated for at the logic control section of the printhead and is not transferred to the MPU.

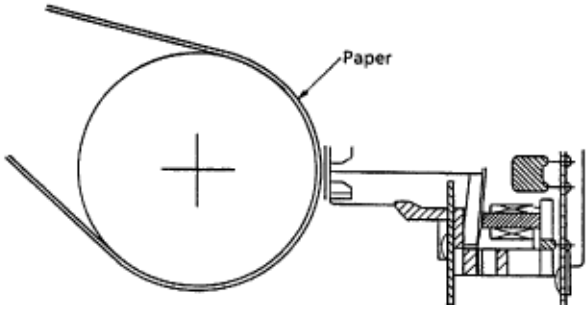
After the character has been printed, the permanent magnet attracts the armature and the print wires are retracted into the wire guide.



(1) When printing



(2) When not printing



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Printhead Temperature

If the printhead temperature exceeds 110 degrees Celsius, the printer will switch to uni-directional print. If the temperature exceeds 118 degrees Celsius, printing will stop. Once the printhead cools, printing will resume.

Two thermistors are used to monitor the printhead temperature. One is contained in the printhead. The other is in the printhead driver.

A thermistor in the printhead prevents over-heating of the coil during periods of continuous bi-directional printing. If the temperature of the coil exceeds the pre-determined limits, the control circuit detects the thermistor signal (TSD).

Another thermistor monitors the temperature of the printhead driver. If the temperature of the driver exceeds the pre-determined limits, the control circuit detects the thermistor signal (TSD).
The voltage of the TSD signal is monitored at the MPU A/D port to control the pass number and print method (uni-directional / bi-directional) at each of seven levels.

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2.2.02 Spacing Mechanism

The spacing mechanism consists of a carriage shaft (mounted parallel to the platen), and a carriage frame which moves along the shaft. The carriage frame is driven by a DC servo motor mounted on the carriage frame.

Items included in the spacing mechanism are listed below.

- Space Motor Assembly
  - DC Servo Motor
  - Motor Gear
  - Sensor
  - Encoder Disk
- Carriage Frame
- Carriage Shaft
- Space Rack

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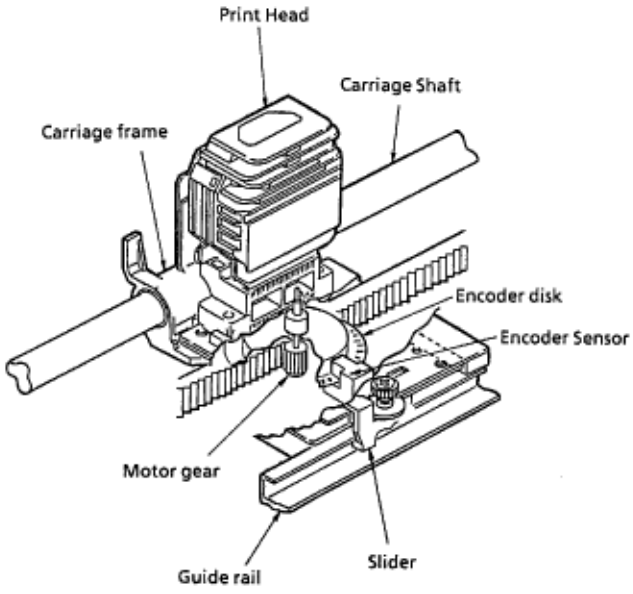
Spacing Operation

The carriage frame, which contains the printhead and space motor, moves along the carriage shaft parallel to the platen. When the space motor rotates, the driving force is transmitted to the motor gear. As the motor gear rotates, the carriage moves along the platen. For every revolution of the DC servo motor, the carriage frame moves 0.8 inch (20.32 mm).

As the DC servo motor rotates, a slotted disk (called the encoder disk), rotates with the servo motor and passes through the photosensor. The position of the carriage frame can be determined by counting the pulses generated by the photosensors.

In the same way, the rotation of the space motor can be recognized and controlled by measuring the phase relationship and the pulsewidth of the signals generated by the photosensors.



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2.2.03 Head Gap Mechanism

The head gap is automatically set for the thickness of the medium loaded in the printer. In the case of envelopes, where the medium thickness varies as the printhead moves along the platen, the strike force of the pins changes to compensate for the differences in thickness.

Head Gap Setting Operation

Once printing starts, the space motor rotates the ribbon gear, causing idle gear C to turn the change gear.

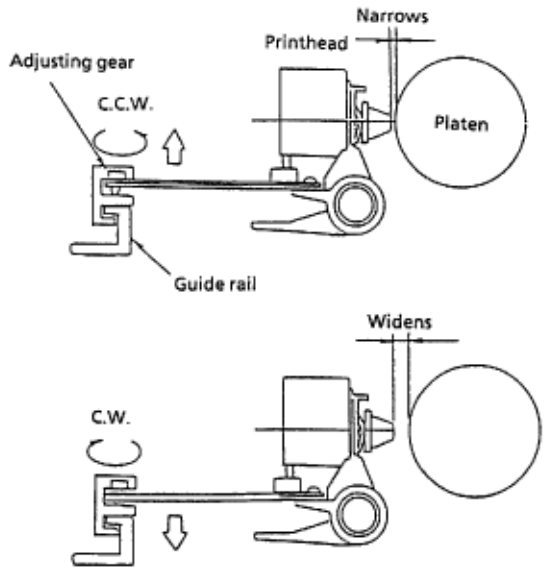
When the MPU requests a change in the head gap setting, the GAP-P signal causes the armature (which is holding the change gear) to be attracted to the pranger magnet. The gap reset spring can now push the change gear so it contacts the gap change gear.

The rotation of the gap change gear causes idle gear D to turn the adjust gear. The adjust gear turns the adjusting screw, resulting in a new head gap setting.

NOTE:

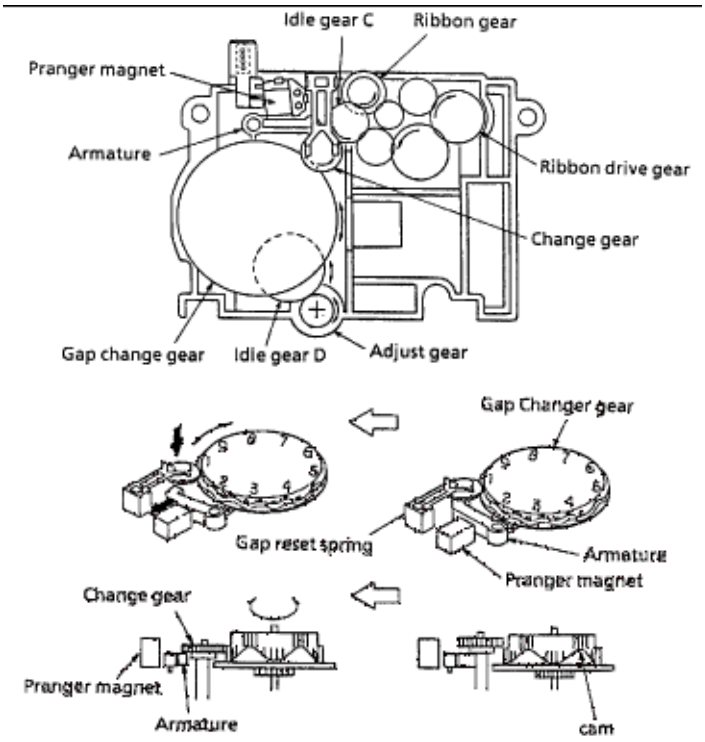
As the adjusting screw turns counter-clockwise, the gap narrows.

As the adjusting screw turns clockwise, the gap widens.



There is a cam at each setting of the gap change gear. When the change gear is at the top of the cam, the change gear disengages from the gap change gear. At this time, the armature resets, changing the head gap by one setting.

The head gap is modified in .06 mm units for each range setting.



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Ribbon Drive Operation

The ribbon drive mechanism feeds the ribbon in synchronization with the spacing operation. The force required to drive the ribbon is obtained from the space motor.

The ribbon drive mechanism is composed of the items listed below.

Ribbon Drive Gear Assembly

Ribbon Gear

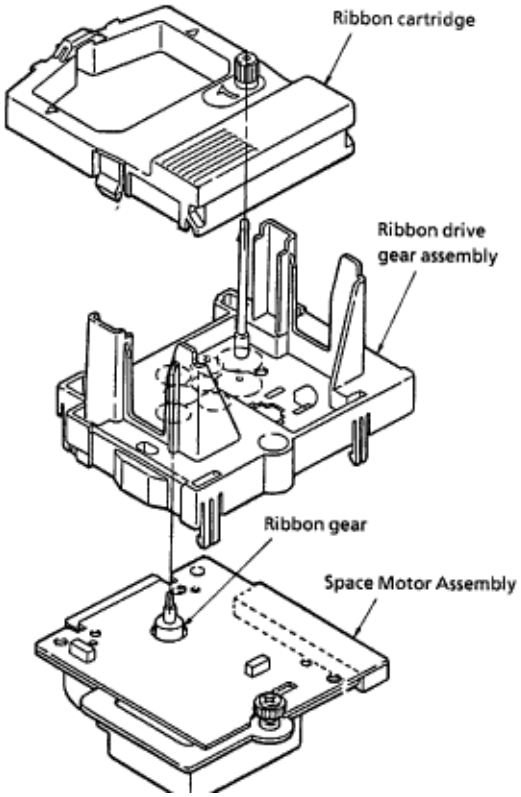
This gear is located on the space motor assembly

Ribbon Cartridge

A continuous loop ribbon with uni-directional feed is used. Ink is supplied from an ink tank, which is built into the ribbon cartridge.

When the space motor turns, the ribbon gear on the spacing motor shaft rotates. The rotation is transmitted via a combination of gears, from the ribbon drive gear assembly to the drive gear in the ribbon cartridge.

Although the space motor moves in both the forward and reverse directions during bi-directional printing, the gears in the ribbon drive assembly maintain uni-directional ribbon feed by switching the rotation direction of the gears.



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2.2.05 Line Feed Mechanism

The line feed operation is accomplished by activating the line feed motor which turns the platen. The rotation of the platen is used to feed paper from the selected paper path.

The components of the paper feed mechanism are listed below.

Line Feed Motor (pulse motor), with gears

Line Feed Idler Gear

Platen

Rear Tractor Feed Unit

Pressure Roller

Change Lever (Paper Path Selection Lever)

The change lever is used to select one of three different paper paths; top, rear or bottom.

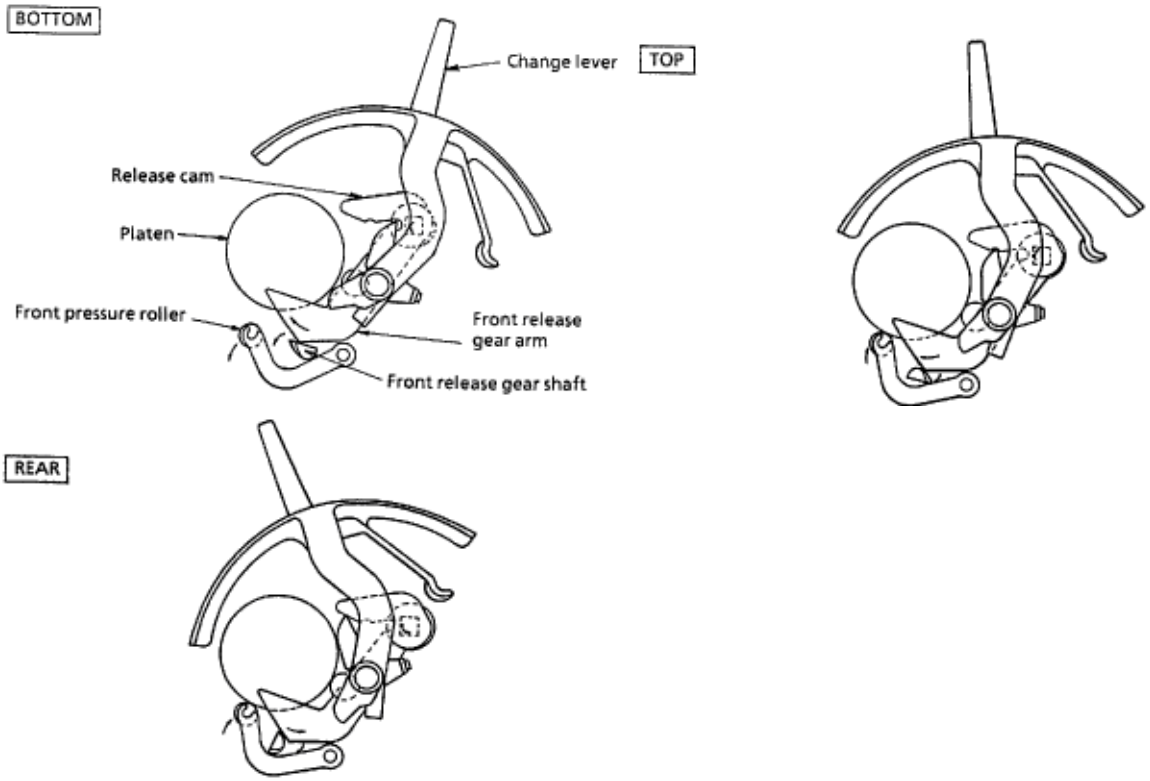
Paper Clamp Mechanism

Moving the change lever between the bottom, top and rear positions, changes the positions of the front release gear arm and the release cam.

The movement of the front release gear arm changes the position of the front release gear shaft. This causes the front pressure roller to open or close.

The movement of the release cam causes the rear pressure roller to open or close.

Position of Change Lever	Status of Front Pressure Roller	Tension of Front Pressure Roller	Status of Rear Pressure Roller	Tension of Rear Pressure Roller
Bottom	OPEN	N/A	OPEN	N/A
Top	CLOSED	250 g	CLOSED	700 g
Rear	CLOSED	90 g	OPEN	N/A



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Cut Sheet/Continuous Sheet Switching Mechanism

Top Feed (for cut sheet paper)

When cut sheet paper is used during normal operation or by the Cut Sheet Feeder (CSF) option, place the change lever in the Top Feed position.

As the platen turns, the platen gear causes the idle gear to rotate.

At this time, the rear and front pressure rollers are pressed securely to the platen to feed the cut sheet.

The cut sheet detection lever enables the cut sheet detection switch (which is located on the main control board). This places the printer in the cut sheet mode.

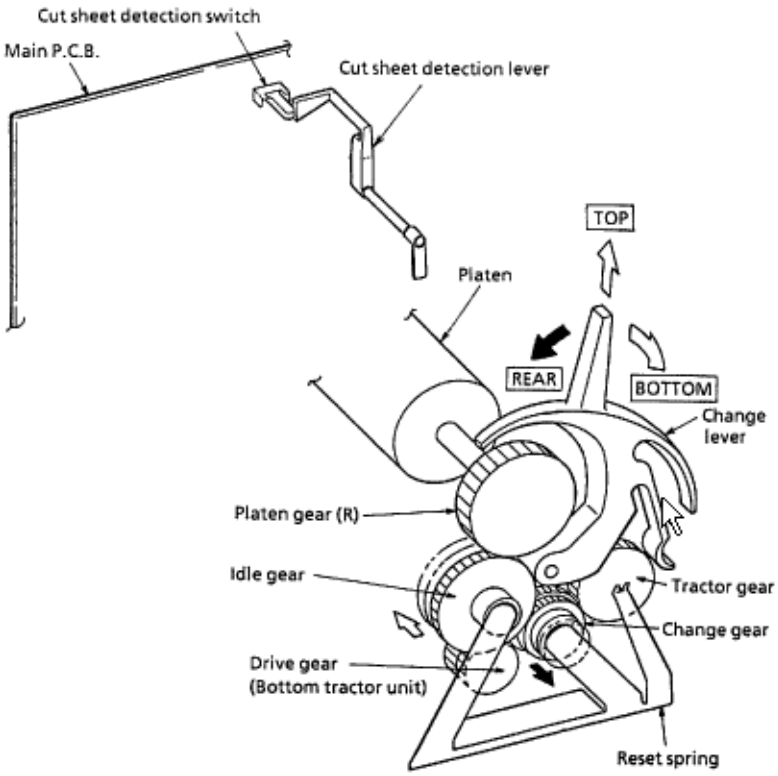
When cut sheet paper is placed between the platen and the paper chute, the printer automatically feeds the sheet to the print start position.

Rear/Bottom Feed (for continuous feed paper)

When the continuous feed paper is used, either with the rear tractor, optional bottom tractor or optional pull tractor, place the change lever in the Rear/Bottom Feed position.

When the change lever is placed in this position, the reset spring pushes the change gear. In this position, the idle gear is engaged with the bottom tractor unit drive gear and the tractor gear. As the platen turns, power is transferred from the platen gear, to the idle gear, to the change gear, and then to the push tractor shaft.

CAUTION:
The cut sheet / continuous sensor lever must be positioned below the BASW sensor. The lever should contact the sensor only when the change lever is in the top feed (middle) setting.
If the lever is not correctly positioned, the ALARM lamp will light and the unit will not automatically load paper or receive data.



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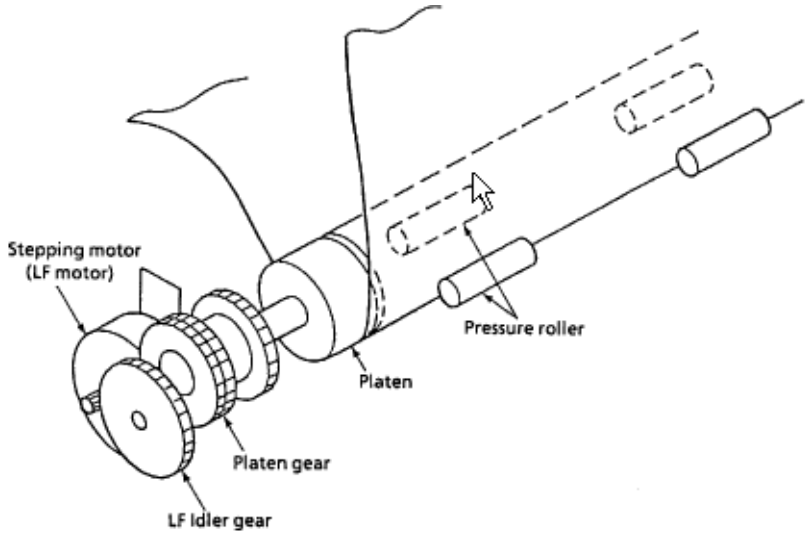
Cut Sheet Paper Feed Operation

As the line feed motor rotates, power is transferred through the decelerating gears (line feed idler gear, platen gear) to the platen.

When using cut sheet paper, the change lever must be in the TOP position so the platen and pressure rollers can feed the paper. This also disengages the push tractor.



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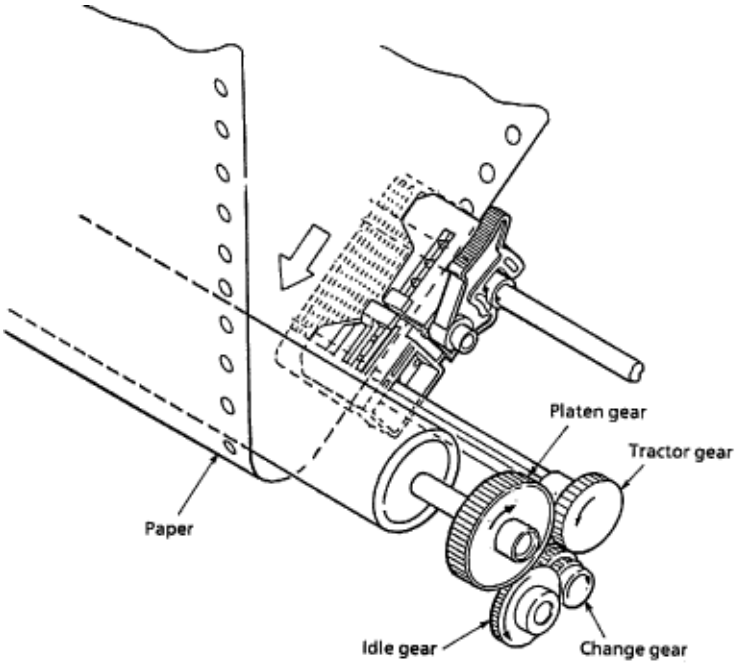
Continuous Paper Feed (Rear Tractor Mechanism)

As the platen rotates, power is transferred to the tractor gear from the platen gear, the idler gear, and the change gear. The tractor gear drives the pin tractor belts, which feed the continuous paper.



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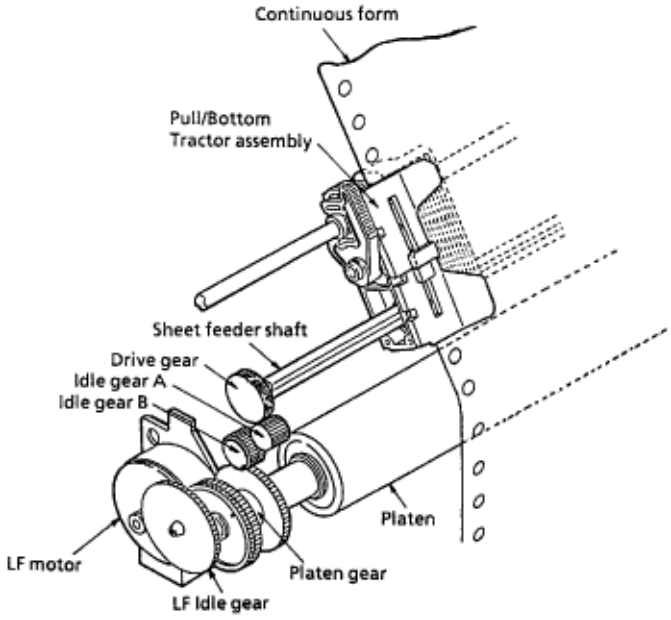
Continuous Paper Feed (Pull Tractor Mechanism)

Bottom feed of continuous sheets is possible *only* when an optional pull tractor unit is installed.
As the platen rotates, power is transferred to the drive gear from the line feed idler gear, the platen gear, idler gear B and idler gear A. The drive gear turns the pull tractor assembly, which feeds the continuous paper.



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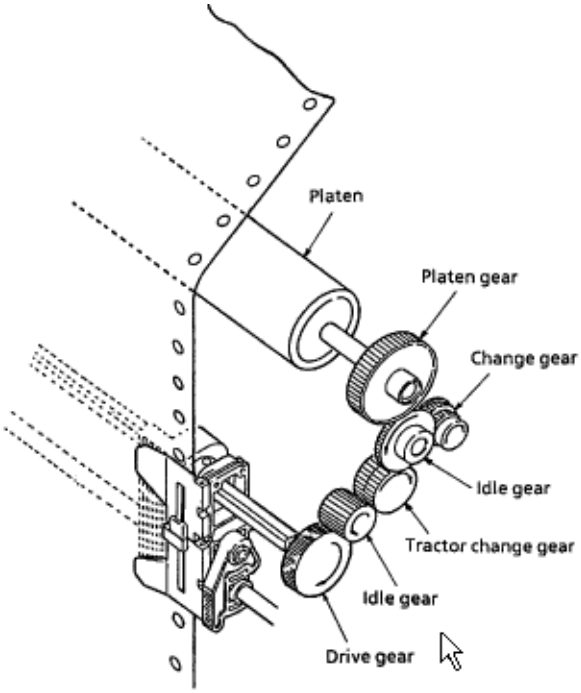
Continuous Paper Feed (Bottom Tractor Feed Mechanism)

As the platen rotates, power is transferred to the drive gear from the platen gear, the idle gear and the tractor change gear. The drive gear turns the pin tractor belts on the bottom tractor feed unit, which feeds the continuous paper.



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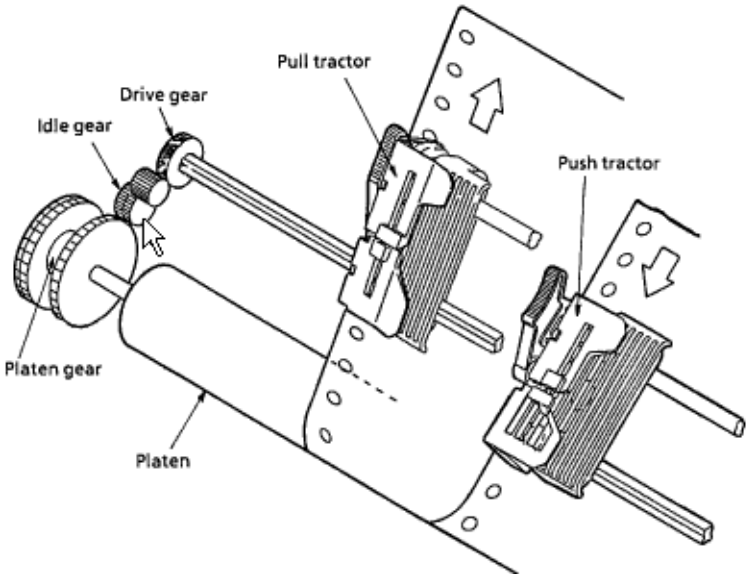
Continuous Paper Feed (Push/Pull Tractor Mechanism)

This mechanism consists of an optional pull tractor and a standard push tractor mechanism. Continuous paper is fed by these two tractors at the same time.



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2.2.06 Paper Detection Mechanism

Top Feed Paper Detection

When cut sheet paper is inserted into the printer, Point A of the Rear/Top Paper Feed Lever is pushed backward, causing the Sensor Lever to rotate.

As the Sensor Lever rotates, it contacts the Rear Sensor Lever. This makes the Rear Sensor Lever rotate.

The Rear Sensor Lever rotates, unblocking the Rear / Top Paper End Sensor (SNS1).

Rear Feed Detection

When paper is fed from the Rear Push Tractor, Point B is pushed backward. This makes the Sensor Lever rotate.

As the Sensor Lever rotates, it contacts the Rear Sensor Lever. This makes the Rear Sensor Lever rotate.

The Rear Sensor Lever rotates, unblocking the Rear / Top Paper End Sensor (SNS1).

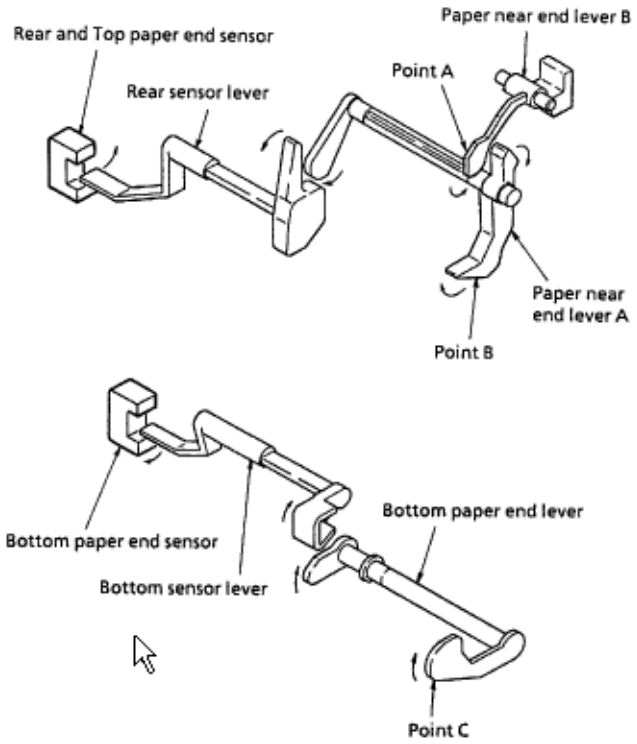
Bottom Feed Detection

When the paper is fed from the bottom of the printer, Point C is pushed, rotating the Bottom Paper End Lever.

As the Bottom Paper End Lever rotates, it contacts the Bottom Sensor Lever. This makes the Bottom Sensor Lever rotate.

The Bottom Sensor Lever rotates, unblocking the Bottom Paper End Sensor (SNS2).

NOTE:
The method for detecting a paper-end condition is the reverse of the above.
PAPER-END is detected when the Bottom Paper End Sensor (SNS2) is blocked.



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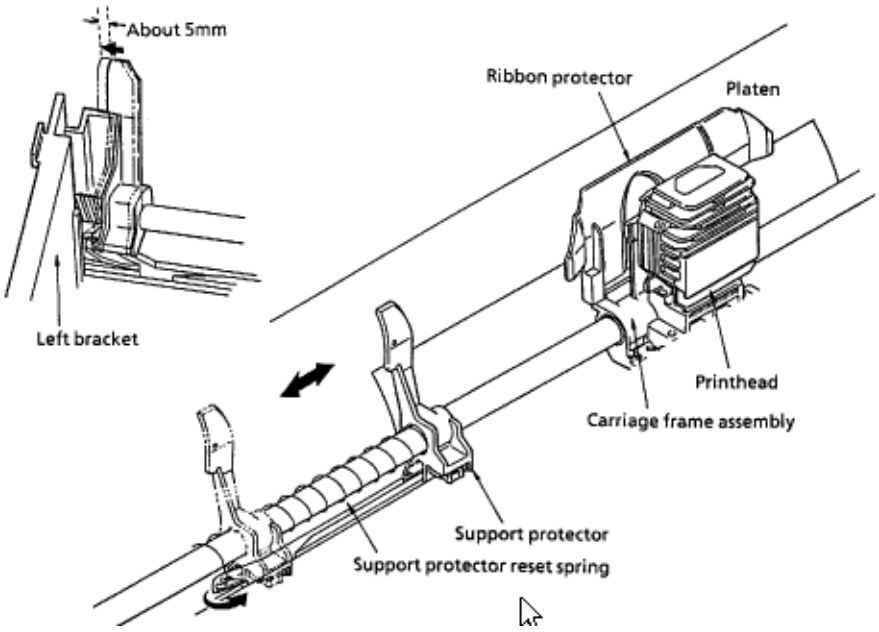
2.2.07 Support Protector Mechanism

During printer initialization, the support protector is latched in the stored position (approximately 5 mm from the left bracket of the main frame).

Just before paper is loaded, the printhead moves towards the left bracket and unlatches the support protector.

As the printhead moves to the right, the support protector reset spring pushes the support protector toward the center of the platen. With the support protector in this position, the ribbon protector and the support protector prevent the leading edge of the paper from curling or folding.
Once the paper is ejected, the printhead slowly moves towards the left bracket. The support protector is latched in the stored position when it is pushed to approximately 5 mm from the left bracket.



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2.2.08 Automatic Paper Load

The Microline 520/521 printers will automatically detect cut sheet paper and feed the paper to the Top of Form (TOF) position.

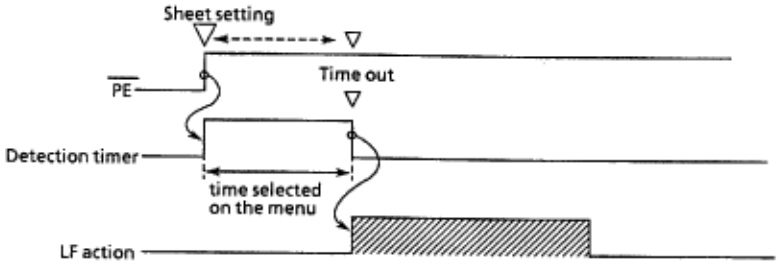
Cut Sheet Paper

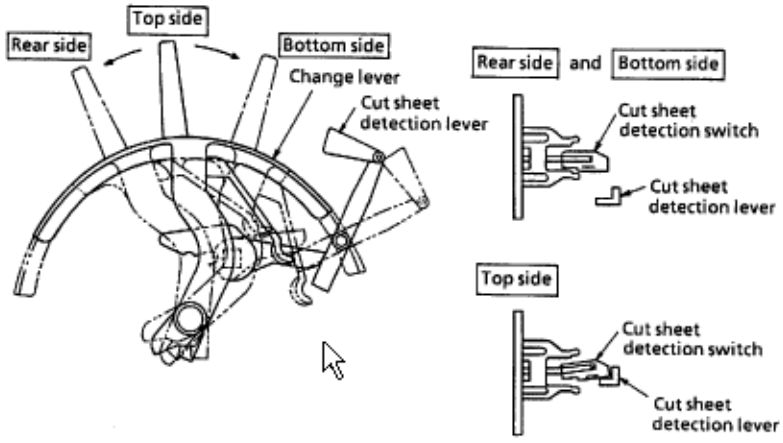
Set the change lever to the TOP FEED position.

NOTE:
When the change lever is in the TOP FEED position, the cut sheet detection lever contacts the cut sheet detection switch (BASW), which is located on the main control board.

Insert the sheet of paper between the platen and the paper chute.

Once paper is detected at the paper end sensor and the amount of time selected on the *Wait Time* setting of the menu has lapsed, the line feed motor will feed the paper until the leading edge of the paper reaches the top of form position.





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Continuous Feed Paper

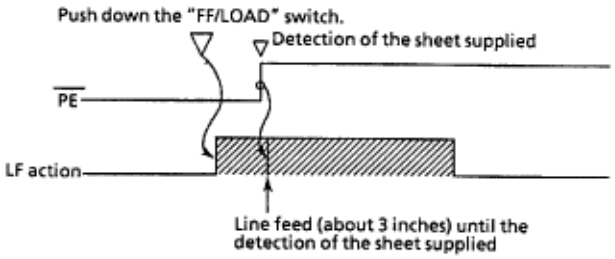
Set the change lever to either the REAR FEED or BOTTOM FEED position.

NOTE:
When the change lever is in the REAR FEED or BOTTOM FEED position, the cut sheet detection lever does NOT contact the cut sheet detection switch (BASW), which is located on the main control board.

Place continuous feed paper in the appropriate tractor.

Press the FF/LOAD switch.

The line feed motor will feed the paper until the leading edge of the paper reaches the top of form position.


Push down the "FF/LOAD" switch.
Detection of the sheet supplied
PE
LF action
Line feed (about 3 inches) until the detection of the sheet supplied

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2.2.09 Paper Park

If continuous feed paper is installed and printing on cut sheet paper is desired, it is not necessary to unload the continuous feed paper. The Paper Park feature provides a means of retracting the continuous feed paper from the paper path, while (at the same time) cut sheet paper is fed.

Paper Park Operation

Place the change lever in the REAR FEED or BOTTOM FEED position.

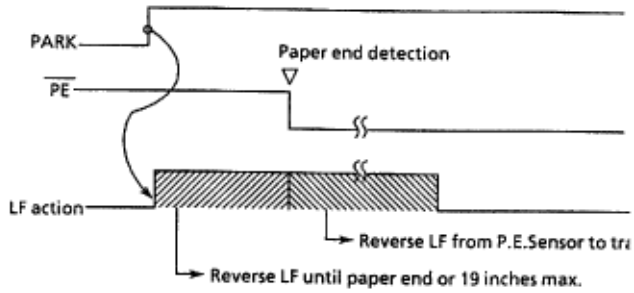
Press the PARK switch on the operation panel.

A reverse line feed operation retracts the paper until paper-end occurs or 19 inches of paper have been retracted.

NOTE:
Retracting 19 inches of paper without detecting a paper-end condition causes the line feed operation to stop. The line feed operation stops because the printer assumes a jam has occurred.

The operator can press the SEL switch to reset the ALARM LED and press the PARK switch to continue the park operation.

This operation may be useful when length of the paper to be parked is greater than 19 inches.



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3.1.01 General Information

This section lists the parts replacement, adjustment, cleaning, lubrication, and shipping procedures.

Disassembly should not be performed unless absolutely necessary. **NEVER** perform disassembly on a malfunctioning printer until you have followed the failure analysis procedures in Section Four of this Service Handbook.

Follow the procedures listed in *Adjustments and Service Settings*. Adjustments may be required when either consumable or parts are replaced. Failure to perform these procedures could result in unnecessary service calls.

Proper performance of maintenance and cleaning will help to achieve the best possible print quality from the printer.

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3.1.02 Maintenance Tools

The following tools are required to service the printer.

#2 Phillips Screwdriver (with magnetic tip)

Straight-slot Screwdriver

Needle Nose Pliers (4 Inch)

Wire Cutters

Digital Multimeter

Feeler Gauge (capable of measuring .014 inches)

Shop Vacuum

Clean, soft, and lint-free Cloth

All-Purpose Cleaner

Contact Kleen (Okidata P/N 51802301)

Platen Cleaner

Machine Grease

Machine Oil

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3.1.03 Maintenance Precautions

1. Do not disassemble the unit if it is operating normally.
2. Before starting disassembly and assembly, always turn the AC power switch OFF and pull out the AC plug.
3. Detach the interface cable, if installed.
4. Do not remove parts unnecessarily. Try to keep disassembly to a minimum.
5. Use the recommended maintenance tools.
6. When disassembling, follow the listed sequence. Failure to follow the correct sequence may result in damaged parts.
7. Since screws, collars and other small parts are easily lost, they should be temporarily attached to the original positions.
8. When handling circuit boards use extreme care. Integrated circuits (microprocessors, ROM, and RAM) can be destroyed by static electricity.
9. Do not place printed circuit boards directly on conductive surfaces.
10. Follow the recommended procedures when replacing assemblies and units.
11. Perform the printhead gap adjustment procedure **(Refer to Section 3.3 of this Service Handbook) when the any of the following occur.**

    Print Quality is darker on one side of the document.

    Parts are replaced

    Printhead (3.2.02)

    Space Motor Assembly (3.2.11)

    Space Rack (3.2.13)

    Guide Rail (3.2.15)

    Platen Assembly (3.2.19)

    Carriage Shaft (3.2.25)

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3.2 DISASSEMBLY/ASSEMBLY PROCEDURES

General Information

This section contains the printer disassembly procedures. Only the removal procedures are explained here. Reverse the procedure for the installation.

At the bottom of each procedure is a listing of the parts covered in that procedure. The Okidata part number, item description, comment (RSPL, Option, Consumable) and cross-reference to Appendix B is provided for each part. Items included in the Recommended Spare Parts List are indicated by the acronym RSPL. N/A will appear where a part number is not available.

520 indicates that the item is specific to the Microline 520.

521 indicates that the item is specific to the Microline 521.

Both indicates that the item is common to both printers.

Part Number	Description	Item	Comment Reference	Appendix B

This Service Handbook lists the disassembly procedures for major components of the unit. Okidata DOES NOT recommend disassembling a unit which is operating normally. If you decide to perform disassembly during this training, Okidata recommends that you perform *only* the disassembly procedures for RSPL items. All other procedures are provided to assist you in identifying parts. It is not likely that you will perform these procedures while servicing the unit.
Be sure to read all notes, cautions, and warnings, as they contain important information regarding disassembly / assembly.

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3.2.01 Preliminary Items

1. Press the AC switch (1) and power off the printer.
2. Remove the paper, if installed (2).
3. Detach the AC power cord (3).
4. Detach the interface cable, if installed (4).

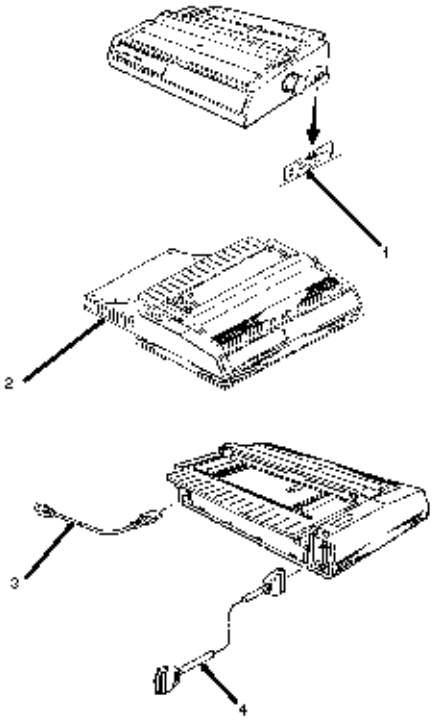
P/N 56609701 Cord: AC RSPL Both B.2.03

P/N 56624101 Cord: AC 220V (ML Series) Right Angle Option RSPL Both B.2.03

P/N 56624401 Cord: AC 240V Option RSPL Both B.2.08

P/N 70000803 Kit: Parallel Interface Option Both B.2.08 Plug n Play Accessory

P/N 70012801 Kit: RS232-C Serial Interface Option Both B.2.08



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3.2.02 Printhead Assembly

1. **Perform this procedure: 3.2.01.**

2. Open the access cover (1).

3. Lift and remove the ribbon. (*Not shown*)

4. Pull the head clamp (2) towards the right and then rotate it up to release the printhead (3).

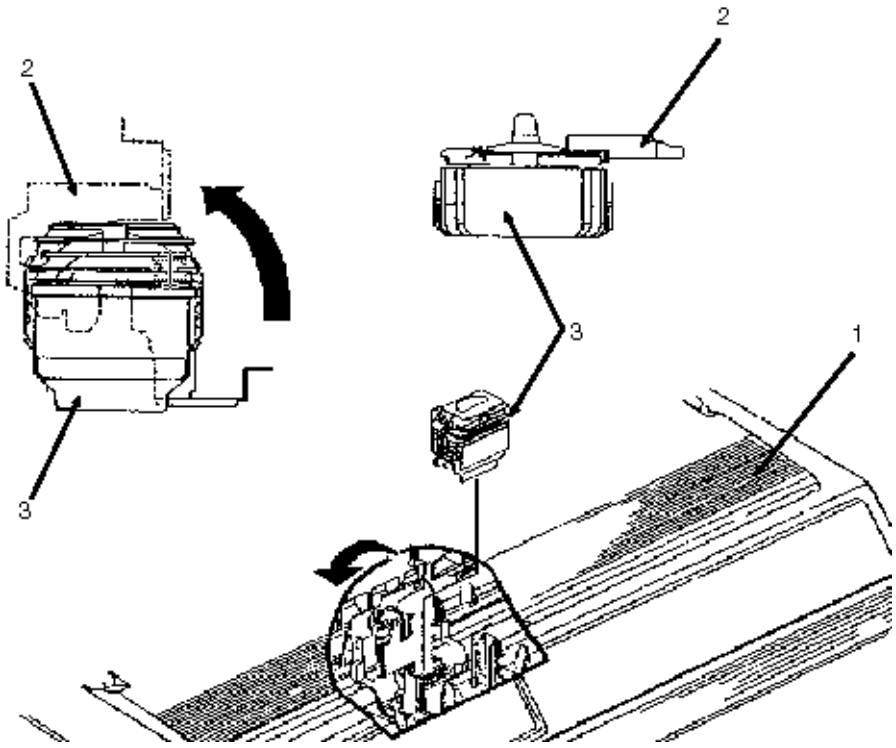
5. Pull the printhead straight up to remove it.

NOTE:
Installation After installing the printhead, check the printhead gap adjustment. **Refer to Section 3.3 of this Service Handbook.**

P/N 52107001 Ribbon: Black Consumable Both B.2.10

P/N 50707401 Clamp: Head RSPL Both B.2.07

P/N 50099501 Assembly: Printhead RSPL Both B.2.03



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3.2.03 Ribbon Protector

CAUTION
You MUST use a straight slot screwdriver to release the ribbon protector. If you attempt to lift the protector without releasing the tabs, the protector will break.

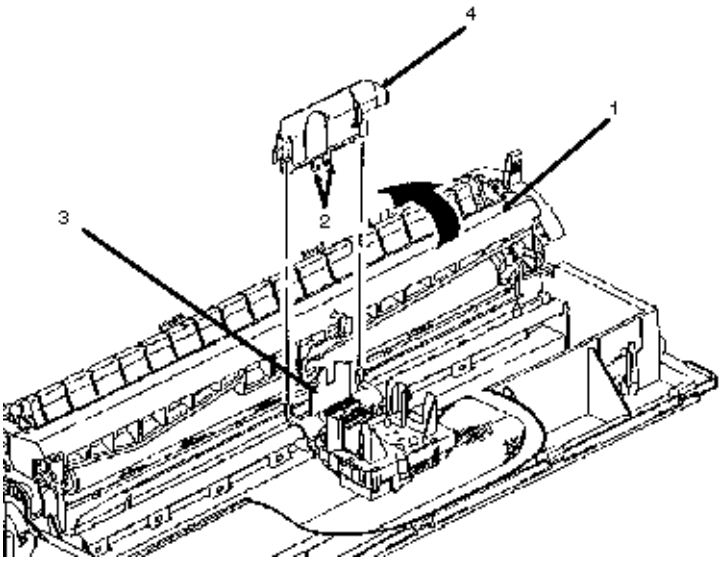
1. **Perform these procedures: 3.2.01, and 3.2.02**.

2. Open the pull-up roller cover (1).

3. Use a straight-slot screwdriver to release the extensions (2) from the carriage frame set (3).

4. Lift the ribbon protector (4) straight up and remove it.

P/N 53562801 Protector: Ribbon RSPL Both B.2.07



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3.2.04 Gear Case Assembly

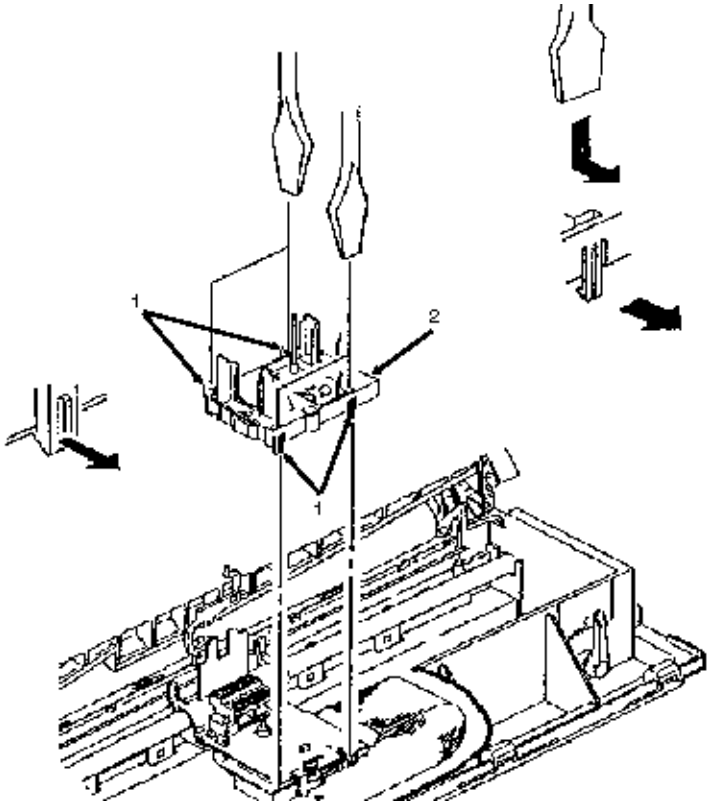
1. **Perform these procedures: 3.2.01, and 3.2.02.**

2. Use a straight-slot screwdriver to release the four claws (1) of the gear case assembly (2).

3. Lift and remove the gear case assembly.

NOTE:
Lubrication --- **When lubricating, refer to Section 3.5 of this Service Handbook.**

P/N 51228501 Gear: Case (Assembly) RSPL Both B.2.07



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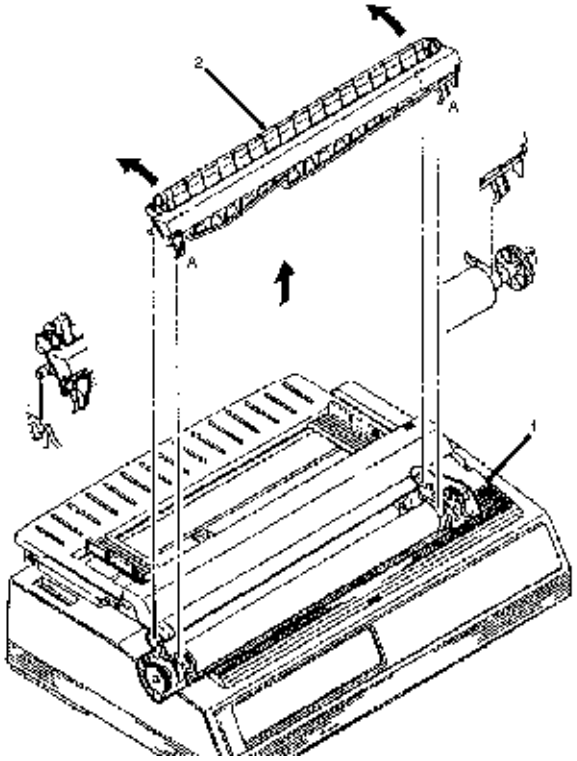
3.2.05 Pull-up Roller Assembly

1. **Perform this procedure: 3.2.01.**
2. Open the access cover (1).
3. Open the cover of the pull-up roller assembly (2).
4. Press at A while rotating the assembly towards the back of the printer.
5. Remove the assembly.

NOTE: *Lubrication*
When lubricating, refer to Section 3.5 of this Service Handbook.



P/N 53341501 Roller: Pull Up Assembly (Narrow) RSPL 520 B.2.05

P/N 53341601 Roller: Pull Up Assembly (Wide) RSPL 521 B.2.05

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3.2.06 Upper Cover, Access Cover, and Sheet Guide Assemblies

1. **Perform this procedure: 3.2.01.**

2. Pull the platen knob (1) straight out and remove it.

3. Set the change lever (2) to the bottom feed position (toward the rear of the printer).

4. Insert a flat-blade screwdriver into the grooves (3) of the frame and pry the upper cover (4) away from the frame.

5. Raise the front side of the upper cover assembly.

6. Tilt the upper cover assembly toward the rear to disengage the claws (not shown) at the rear of the frame.

7. Lift the upper cover assembly and remove it.

CAUTION:
Do not rotate the access cover past the vertical when removing it or you will break the tab extensions.

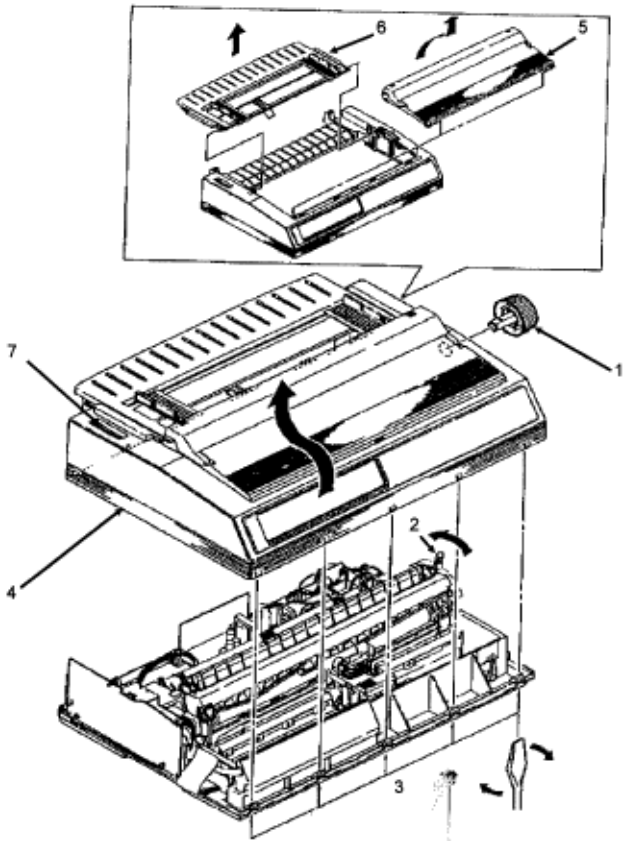
8. Raise the access cover assembly (5) until it is vertical, then lift it straight up to remove it.

9. Remove the sheet guide assembly (6).

10. Note the position of the cover (B) [for card slot] (7). This is part of the upper cover and should not be removed. No font cards are currently available.

CAUTION:
*When installing the upper cover, make sure that the sensors correctly contact the control board **(3.2.07).** The cut sheet/continuous sensor lever must be positioned below the BASW sensor. The lever should contact the sensor only when the change lever is in the top feed (middle) setting. If the lever is not correctly positioned, the ALARM lamp will light and the unit will not automatically load paper or receive data.*

When cleaning, refer to Section 3.4 of this Service Handbook.



P/N 51009401 Guide: Sheet (Narrow) RSPL 520 B.2.02

P/N 51009501 Guide: Sheet (Wide) RSPL 521 B.2.02

P/N 53066902 Cover: Upper (Narrow) RSPL 520 B.2.02

P/N 53067002 Cover: Upper (Wide) RSPL 521 B.2.02

P/N 53067101 Cover: Access (Narrow) RSPL 520 B.2.02

P/N 53067201 Cover: Access (Wide) RSPL 521 B.2.02

P/N 53067301 Cover: (B) for card slot RSPL Both B.2.03

P/N 53562601 Knob: Platen (ML500 Series) RSPL Both B.2.03

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3.2.07 Control Board (FJIM)

1. Perform these procedures: **3.2.01, and 3.2.06.**
2. Remove the two screws (1).
3. Release the control board (2) from the bracket (3).
4. Tilt the board to access the connectors.
5. Detach connectors CN6 - operator panel (4), CN7- carriage cable (5), CN3 - power supply (6), and CN5 - line feed motor (7).
6. Remove the board.

NOTE:

Installation

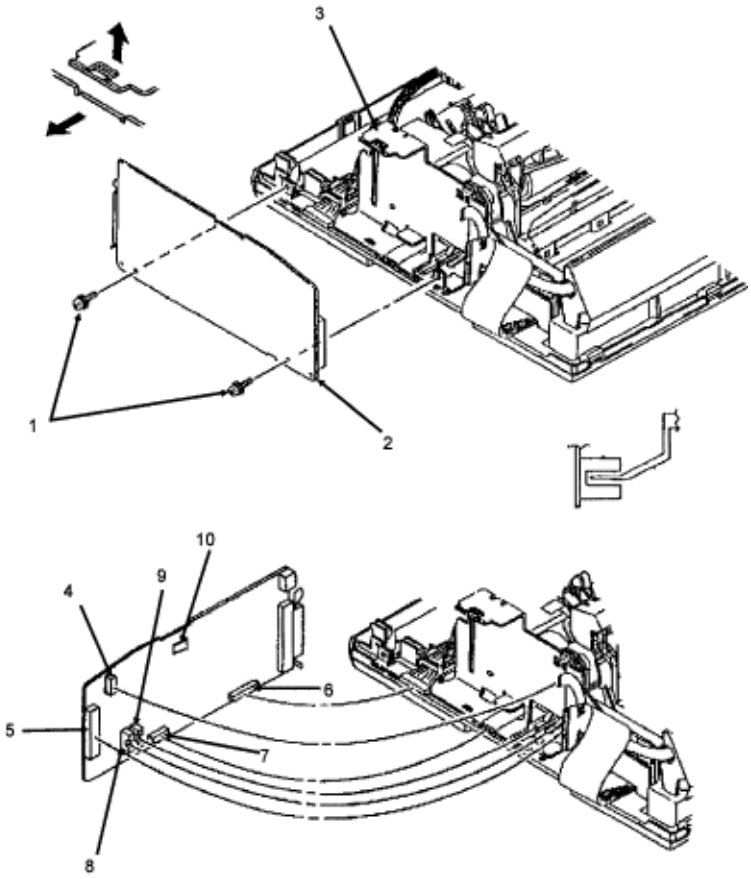
The bottom sensor lever must be positioned in the SNS3 sensor (8).

The rear sensor lever must be positioned in the SNS1 sensor (9).

The cut sheet/continuous sensor lever must be positioned below the BASW sensor (10). The lever should contact the sensor only when the change lever is in the top feed (middle) setting.

If the lever is not correctly positioned, the ALARM lamp will light and the unit will not automatically load paper or receive data.

The IC: EEPROM is soldered in on the board.



P/N 55072401 PCB: FJIM (w/o ROM) RSPL Both B.2.03

P/N 55938301 IC: EEPROM BR93CC46A RSPL Both B.2.03

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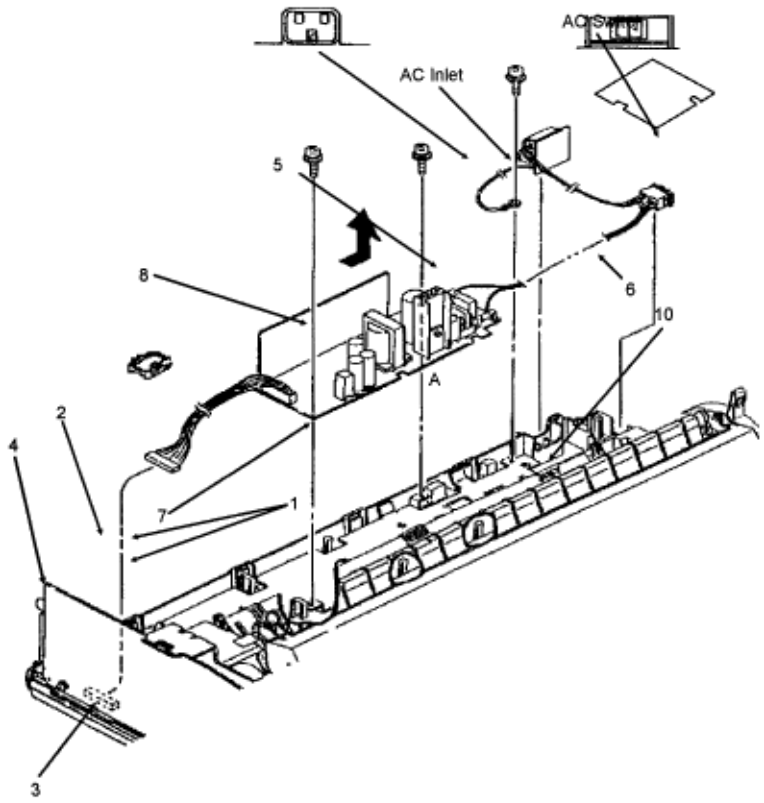
3.2.08 Power Supply Assembly

1. Perform these procedures: 3.2.01 and 3.2.06.
2. Use a straight slot screwdriver to detach the claws from both sides of the cable clamp (1).
3. Remove the cable clamp (2).
4. Detach the transformer cable from connector CN3 (3) of the control board (4).
5. Detach the cable from the connector (5) of the filter board (6).
6. Use a straight slot screwdriver to free the transformer from the holding clamp (A), position the screwdriver in the direction of the arrow (7) twist the screwdriver while pushing the transformer (8) towards the control board .
7. Lift and remove the transformer assembly.
8. Remove the screw (9) from the ground wire of the filter board.
9. Use a straight slot screwdriver to detach the claw (10), tilt the filter board upward, then work the AC inlet and the AC switch free.
10. Lift and remove the filter board assembly.

NOTE:

When installing, verify that the AC inlet and AC switch are oriented correctly.



P/N 56412401 Transformer: 120 V ML520 RSPL 520 B.2.03

P/N 56412402 Transformer: 120 V ML521 RSPL 521 B.2.03

P/N 55073201 PCB: Filter 120 V RSPL Both B.2.03

P/N 50707501 Clamp: Cord RSPL Both B.2.03

P/N 56306201 Fuse: 1A 250V (Filter Brd 220V) Option RSPL Both B.2.03

P/N 56306101 Fuse: 2.5A 125V (Filter Board) RSPL Both B.2.03

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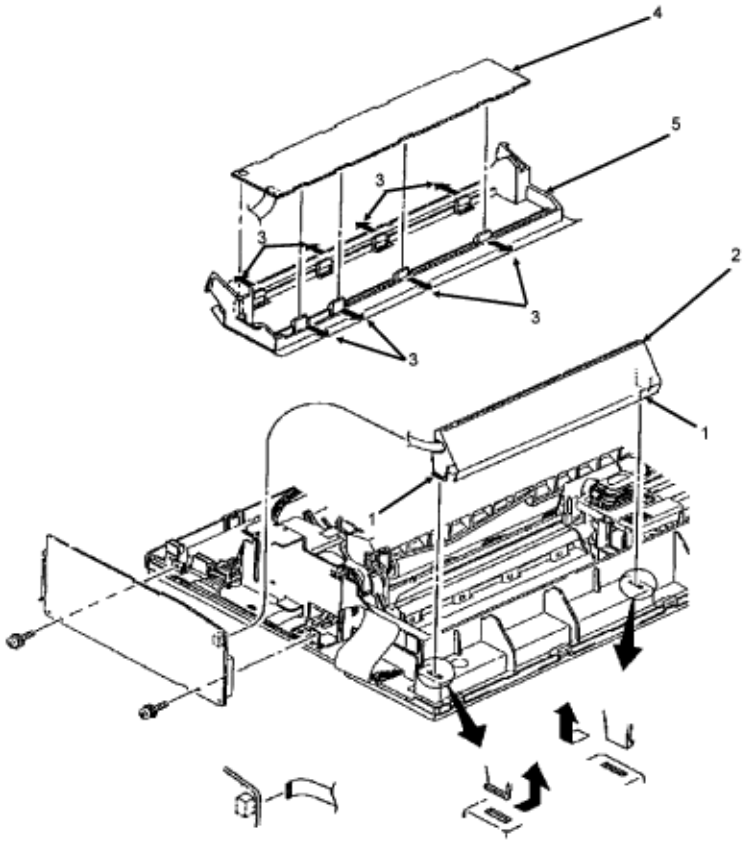
3.2.09 Operator Panel PCB (LEOP)

1. Perform these procedures: 3.2.01, 3.2.06, and 3.2.07.
2. Cut the nylon tie and release the cable. *(Not shown)*
3. Disengage the claws (1) on both sides of the frame.
4. Lift the operator panel assembly (2) straight up and remove it.
5. Open eight claws (3) and remove the operator panel board (4) from the operator panel (5).



P/N 53562703 Panel: Operator RSPL Both B.2.03

P/N 55937502 PCB: LEOP (Operator Panel) RSPL Both B.2.03

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3.2.10 PC Connector

1. Perform these procedures: 3.2.01, 3.2.02, and 3.2.04.
2. Remove the two screws (1) and the connector holders. The holders are not shown.
3. Remove the PC connector (2).

NOTE:

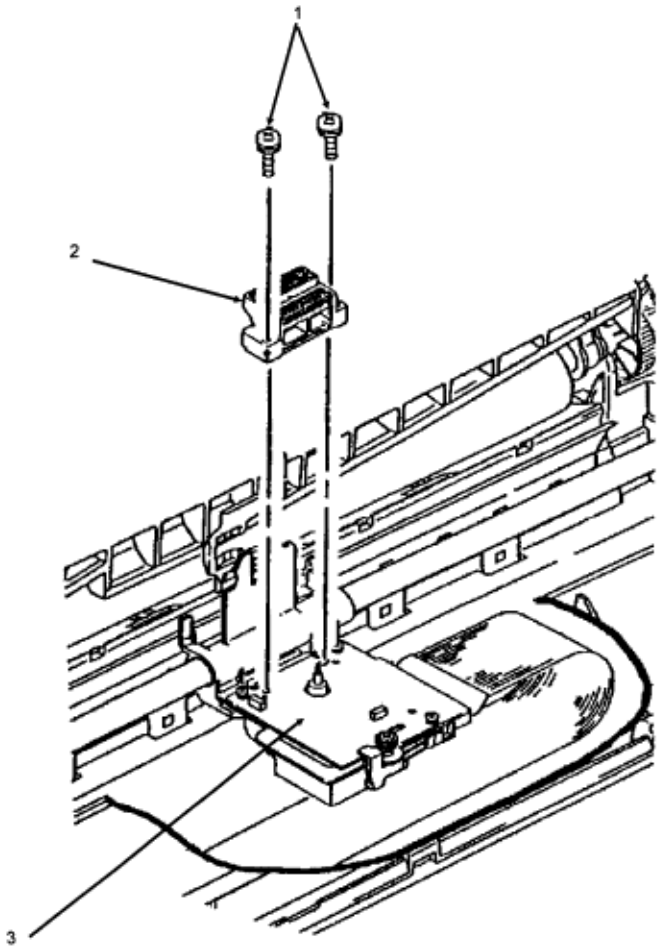
Installation

Do not touch the contacts of the PC connector.

Do not touch the contacts of the space motor (3).

Cleaning

When cleaning, refer to Section 3.4 of this Service Handbook.



P/N 56729601 Connector: PC HD40 RSPL Both B.2.07

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3.2.11 Space Motor and Roller Guide Assemblies

1. Perform these procedures: 3.2.01, 3.2.02, 3.2.04, and 3.2.10.
2. Remove the three screws (1).
3. Lift the space motor assembly (2).
4. Remove the left (3) and right connector holders (4).
5. Remove the roller guide assembly (5) and guide roller spring (6).
6. Use firm pressure to pull the carriage cable (7) out to detach the cable from the space motor assembly.
7. Remove the space motor assembly.

NOTE:

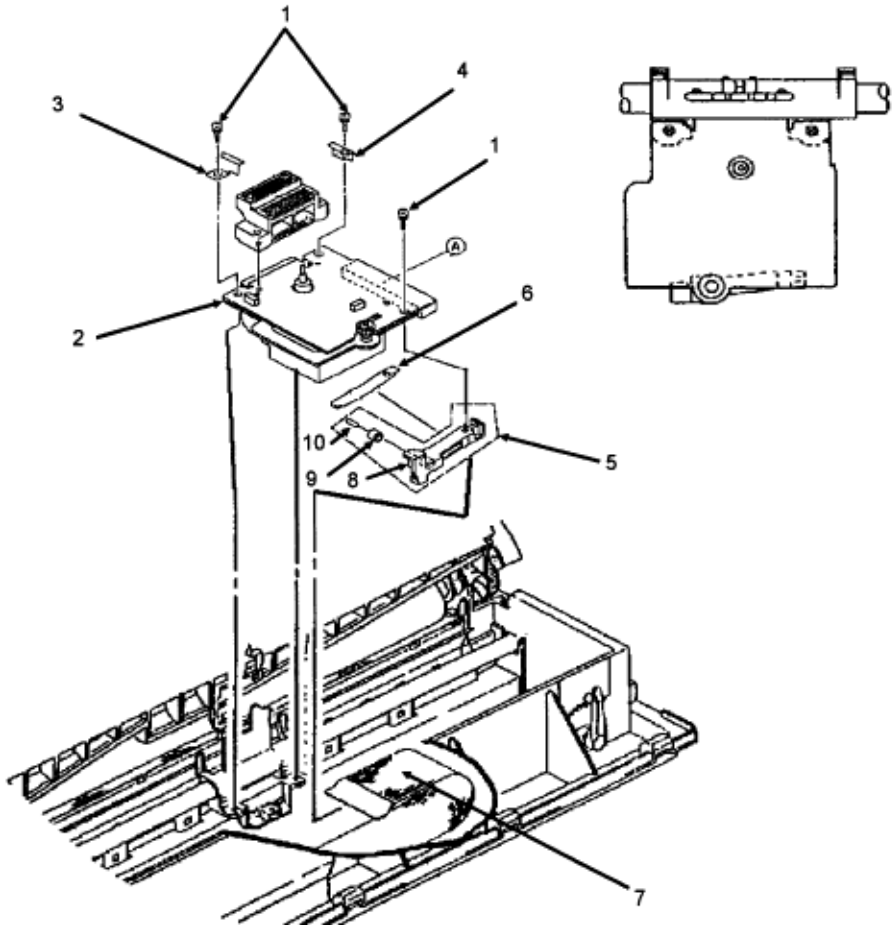
The guide roller assembly includes the guide roller (8), the guide roller holder (9), and the pin (10).

Installation: Position the guide roller assembly first.

The contact side of the cable faces down when the carriage cable is inserted into the connector on the space motor assembly. Work the cable from side to side until it is fully seated in the connector. No contacts should be visible.

After installing the space motor assembly, check the printhead gap adjustment. Refer to Section 3.3 of this Service Handbook.

When lubricating, refer to Section 3.5 of this Service Handbook.



P/N 53343001 Holder: Connector (L) RSPL Both B.2.07

P/N 53343101 Holder: Connector (R) RSPL Both B.2.07

P/N 56510401 Motor: Space Assembly RSPL Both B.2.07

P/N 53343301 Guide: Roller Assembly Both B.2.07

P/N 53341901 Roller: Guide RSPL Both B.2.07

P/N 53342001 Holder: Guide Roller RSPL Both B.2.07

P/N N/A Pin Both B.2.07

P/N N/A Guide Roller Spring Both B.2.07

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3.2.12 Carriage Cable

1. Perform these procedures: 3.2.01, 3.2.06, 3.2.07, and 3.2.11.
2. Slightly bow the carriage cable (1) to release it from the claws (2) and the projection on the main frame (3).
3. Remove the carriage cable guide (4).
4. Remove the carriage cable.

NOTE:

Installation

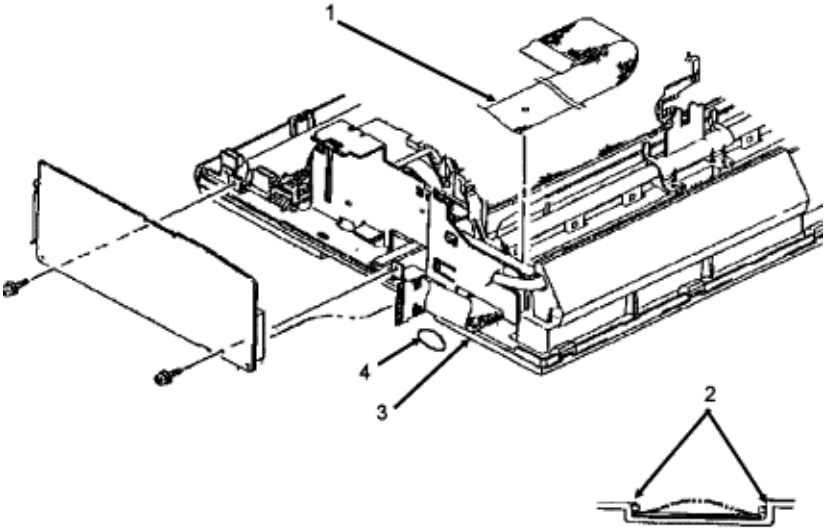
The contacts on the cable face up when the cable is positioned on the main frame.

The cable end with the 45° angled contacts connects to the gear case assembly.

Do NOT sharply bend the carriage cable. You will slightly bow the cable to position it under the claws and over the projection.

P/N 56627301 Cable: Carriage (Narrow) RSPL 520 B.2.07

P/N 56627302 Cable: Carriage (Wide) RSPL 521 B.2.07



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3.2.13 Space Rack

1. Perform these procedures: **3.2.01, 3.2.02, 3.2.04, 3.2.10, and 3.2.11.**
2. Remove the spring (1).
3. Disengage the claws (2) on the both ends of the space rack (3).
4. Pull the space rack straight up and remove it.

NOTE:

Installation

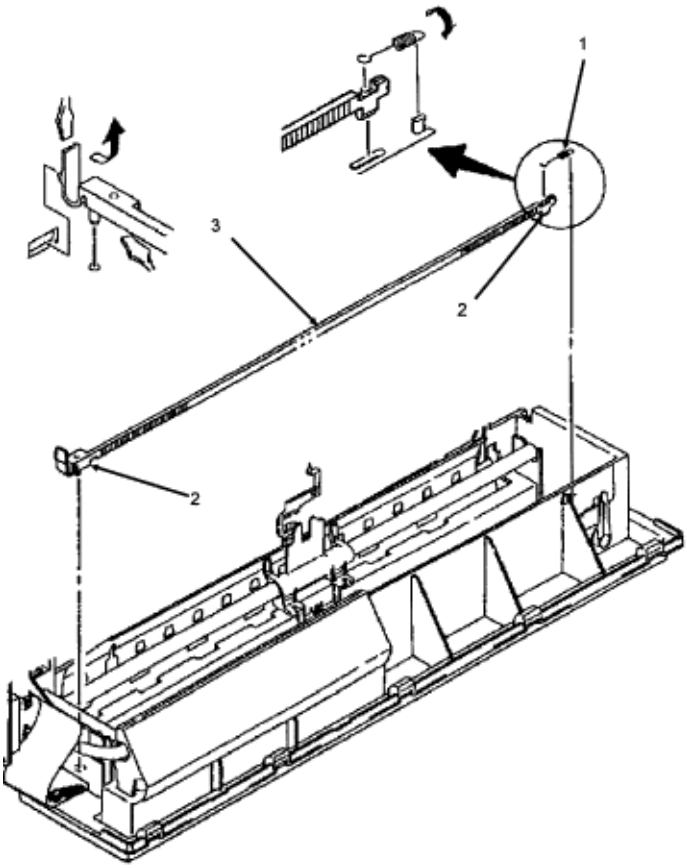
After installing the space rack, check the printhead gap adjustment. Refer to Section 3.3 of this Service Handbook.

Cleaning

When cleaning, refer to Section 3.4 of this Service Handbook.

CAUTION

Do NOT lubricate the space rack. Lubricating the space rack will attract dust. If enough dust accumulates on the space rack, printing problems will occur.



P/N 50923501 Spring: Tension (Space Rack) RSPL Both B.2.04

P/N 53563301 Rack: Space (Narrow) RSPL 520 B.2.04

P/N 53563401 Rack: Space (Wide) RSPL 521 B.2.04

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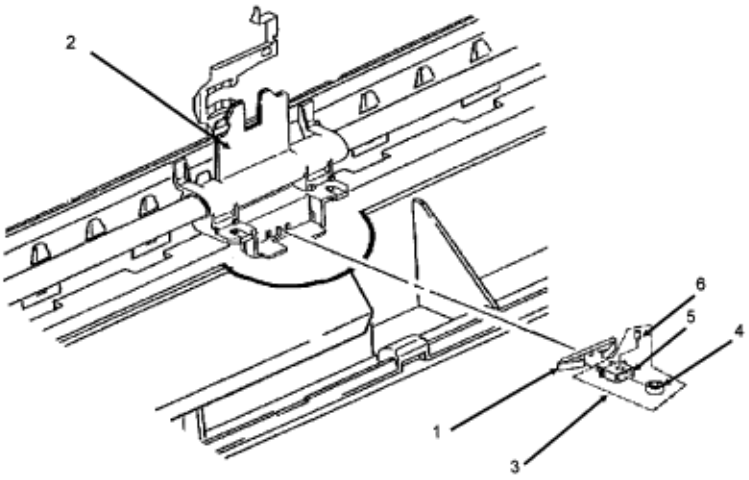
3.2.14 Roller/Holder Backup Assembly

1. Perform these procedures: 3.2.01, 3.2.02, 3.2.04, 3.2.10, and 3.2.11.
2. Use a small straight slot screwdriver to disengage the claws of the backup roller holder spring (1) from the carriage frame (2).
3. Remove the roller/holder backup assembly (3).

NOTE:

The roller/holder backup assembly includes the backup roller (4), the backup roller holder (5), and the pin (6).



P/N 53343201 Assembly: Roller/Holder Backup Both B.2.07

P/N 53341701 Roller: Back Up RSPL Both B.2.07

P/N 53341801 Holder: Back Up Roller RSPL Both B.2.07

P/N N/A Pin Both B.2.07

P/N 50925001 Backup Roller Holder Spring Both B.2.07

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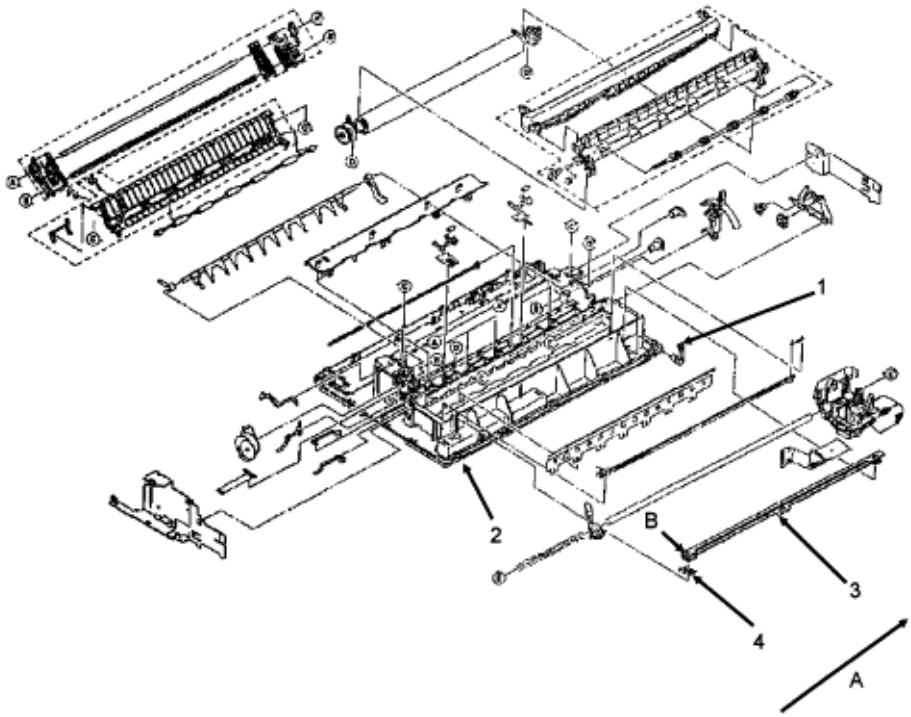
3.2.15 Guide Rail and Adjust Cam

1. Perform these procedures: 3.2.01, 3.2.02, 3.2.04, 3.2.10, 3.2.11, and 3.2.14.
2. Rotate the adjust cam (1) in the direction of arrow A as far as possible.
3. Pull the cam out and remove it.
4. Carefully press the claw (2 *location only*) in the base frame down to release the guide rail (3). Do not press too hard or the claw will break.
5. Use a straight slot screwdriver to slide the guide rail in direction of arrow A.
6. Lift the guide at position B and work the other end of the guide free to remove the guide rail.
7. Remove the ground clip (4)

NOTE:

Installation **After installing the guide rail, check the printhead gap adjustment. Refer to Section 3.3 of this Service Handbook.**



P/N 51009701 Guide: Rail Ground Clip RSPL Both B.2.04

P/N 51009801 Guide: Rail (Narrow) RSPL 520 B.2.04

P/N 51009901 Guide: Rail (Wide) RSPL 521 B.2.04

P/N 53067701 Cam: Adjust RSPL Both B.2.04

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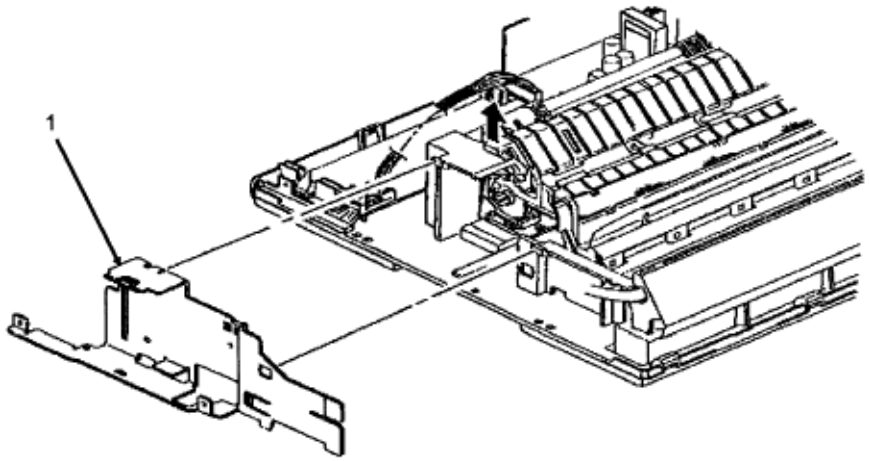
3.2.16 Left Ground Plate

1. Perform these procedures: 3.2.01, 3.2.06, and 3.2.07.
2. Cut the nylon tie and release the cable. (Not shown).
3. Work the left ground plate (1) up, and then out, to remove it.



P/N 51010301 Plate: Left Ground RSPL Both B.2.04

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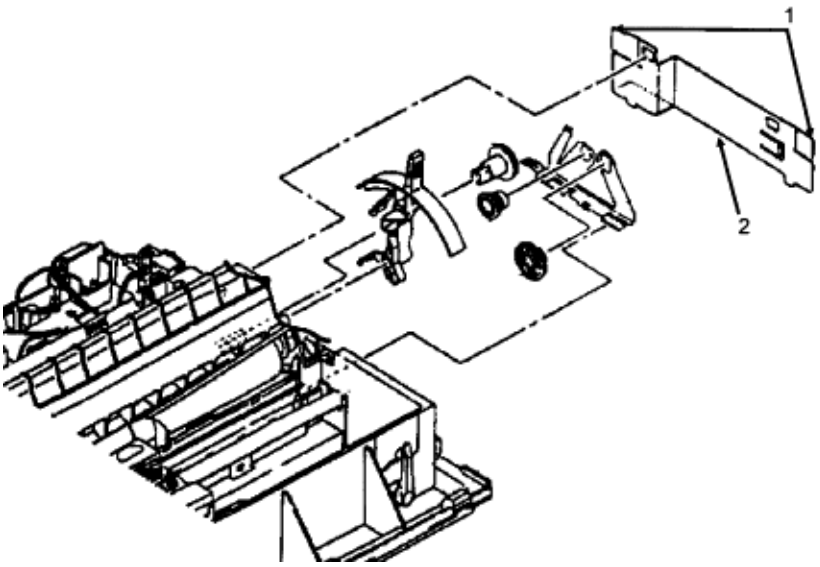
3.2.17 Right Ground Plate

1. Perform these procedures: 3.2.01, and 3.2.06.
2. Pull the top tabs (1) of the right ground plate (2) out to free the plate from the claws of the base frame. You may have to use a screwdriver to work the plate tabs free.
3. Lift the plate and remove it.

NOTE:



Installation The plate must be securely seated under the claws.

P/N 51010201 Plate: Right Ground RSPL Both B.2.05

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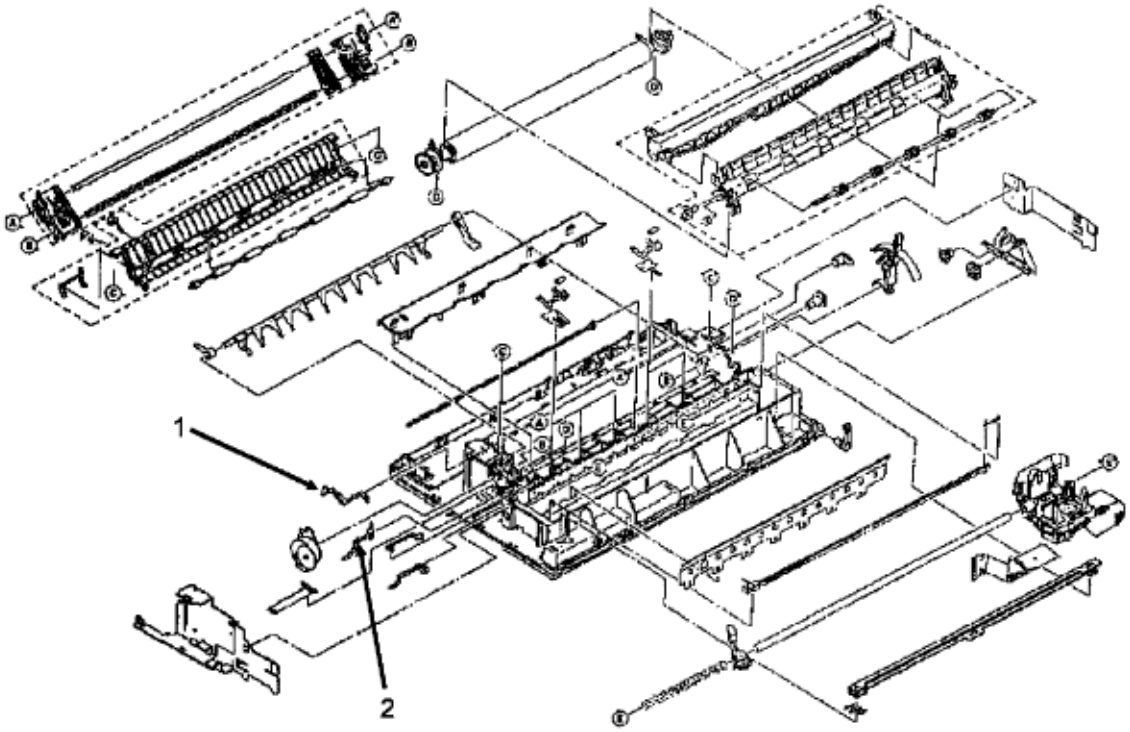
3.2.18 Rear and Cut Sheet Paper Feed Sensor Levers

1. Perform these procedures: 3.2.01, 3.2.06, 3.2.07, 3.2.16, and 3.2.20.
2. Turn the cut sheet/continuous feed paper sensor lever (1) until the flag is at the top, then work the lever free.
3. Remove the lever.
4. Turn the rear feed paper sensor lever (2) until the flag is at the top, then work the lever free.
5. Remove the lever.



P/N 50804902 Lever: Sensor RSPL Both B.2.04 Cut Sheet/Continuous

P/N 50804801 Lever: Rear Sensor RSPL Both B.2.04

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3.2.19 Platen Assembly

1. Perform these procedures: **3.2.01, and 3.2.06.**
2. Move the change lever (1) to the bottom feed position (to the rear of the printer).
3. Push the lock levers (2) in, then rotate them towards the front to unlock them from the frame.
4. The levers should be vertical.
5. Lift the platen assembly (3) straight up and remove it.

NOTE:

Installation

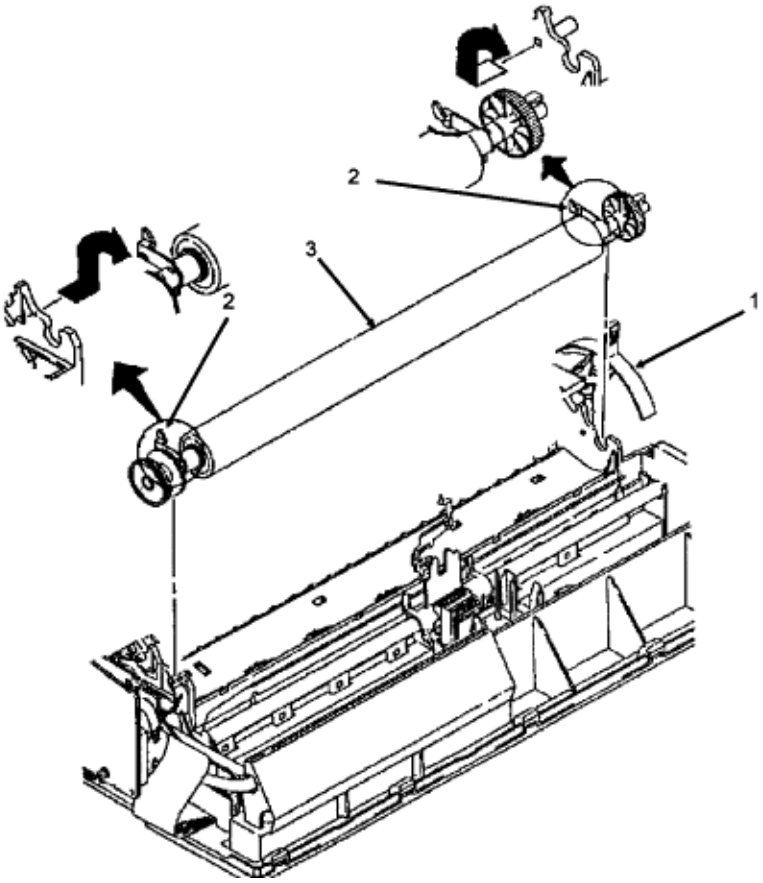
After installing the platen assembly, check the printhead gap adjustment. Refer to Section 3.3 of this Service Handbook.

Cleaning

When cleaning, refer to Section 3.4 of this Service Handbook.

Lubrication

When lubricating, refer to Section 3.5 of this Service Handbook.



P/N 50098301 Platen Assembly (Narrow) RSPL 520 B.2.05

P/N 50098302 Platen Assembly (Wide) RSPL 521 B.2.05

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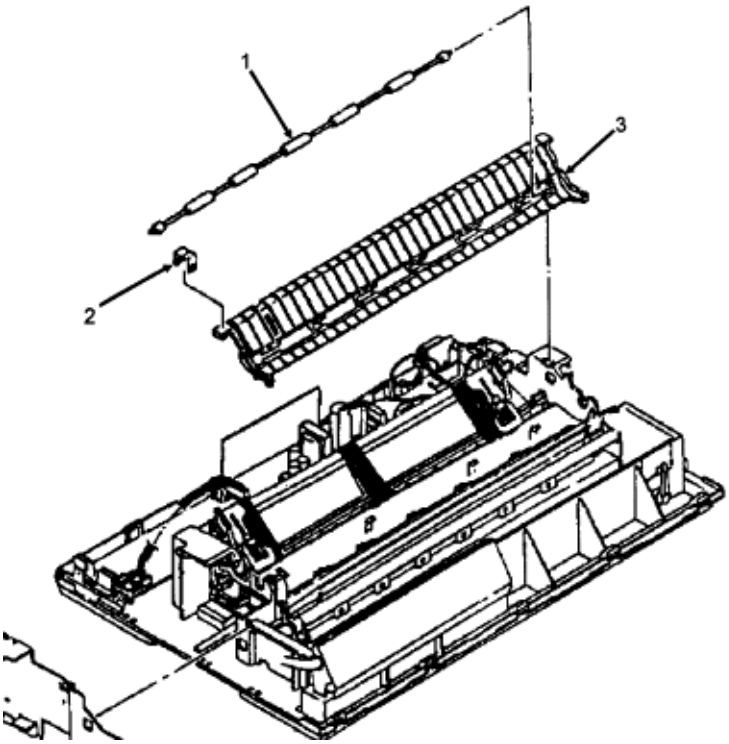
3.2.20 Paper Chute Assembly

1. Perform these procedures: 3.2.01, 3.2.06, and 3.2.19.
2. Remove the rear pressure roller (1).
3. Use a straight slot screwdriver to release the claws of the lock spring (2) and remove the spring.
4. Remove the paper chute assembly (3).

NOTE:

The paper chute assembly includes the levers for the rear and top paper feed paths.



P/N 53341301 Roller: Pressure Rear (Narrow) RSPL 520 B.2.06

P/N 53341401 Roller: Pressure Rear (Wide) RSPL 521 B.2.06

P/N 50924701 Spring: Lock RSPL Both B.2.06

P/N 50097701 Paper Chute Assembly N RSPL 520 B.2.06

P/N 50097801 Paper Chute Assembly W RSPL 521 B.2.06

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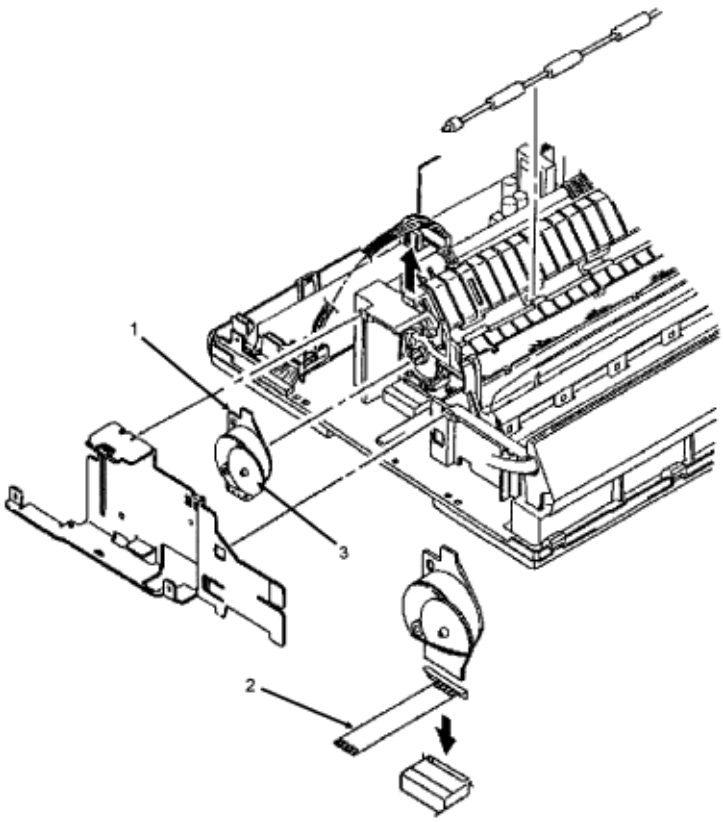
3.2.21 Line Feed Motor Assembly

1. Perform these procedures: 3.2.01, 3.2.06, 3.2.07, 3.2.16, 3.2.19, 3.2.20, and 3.2.21 (this section).
2. Firmly press down on the line feed motor assembly (1) while tilting the assembly out.
3. Remove the line feed motor assembly.
4. Remove the line feed connection cord (2).

CAUTION:

The line feed idle gear (3) should be removed only if it must be replaced. The claws will break when the gear is removed. A new gear must be installed.



P/N 51228401 Gear: Line Feed Idle RSPL Both B.2.04

P/N 56510301 Motor: Line Feed (Assembly) RSPL Both B.2.04

P/N 56627201 Cord: Connection Line Feed RSPL Both B.2.04

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3.2.22 Reset Spring

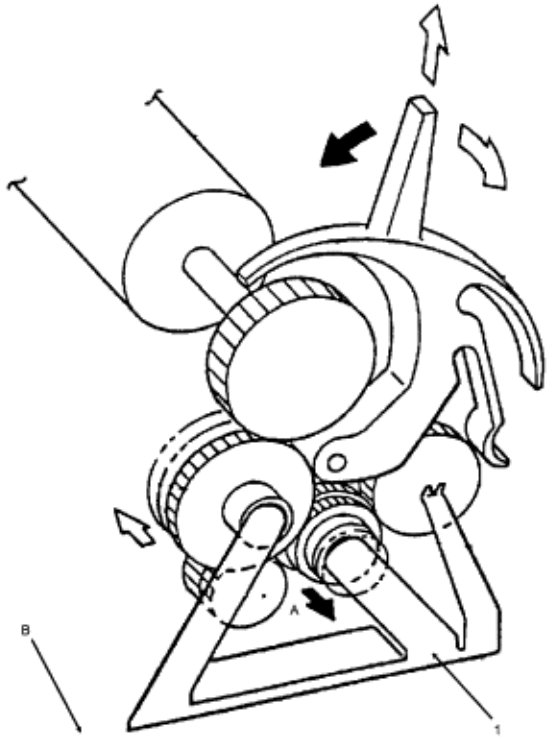
CAUTION:

Please read through this entire procedure before performing it.

Do not press against the vertical extensions of the reset spring at any time during this procedure.

Firm pressure will release the spring, not brute force.

1. Perform these procedures: **3.2.01, 3.2.06, and 3.2.17.**
2. Place the right side of the unit over the edge of your work surface. You must be able to access the bottom of the unit. You will be working underneath and above the reset spring (1) at the same time.
3. Reach from underneath the unit and press up at the extension (A) to free the spring from the claw.
4. While pressing up, slide the spring out (in the direction of Arrow B) and remove it.



P/N 50923201 Spring: Reset RSPL Both B.2.05

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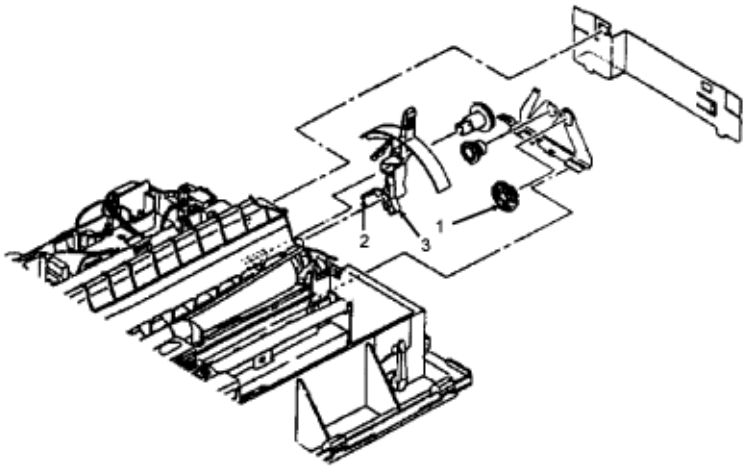
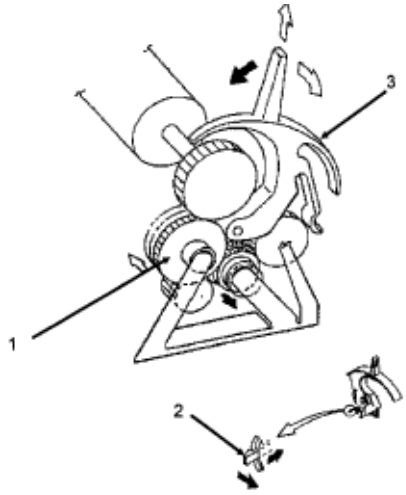
3.2.23 Idle Gear and Change Lever

1. Perform these procedures: 3.2.01, 3.2.06, 3.2.07, 3.2.16, 3.2.17, 3.2.19, 3.2.20, and 3.2.22.
2. Remove the idle gear (1). The idle gear is a large narrow gear.
3. Release the claw (2) of the change lever (3). The claw is accessed from inside the unit.
4. Remove the change lever.

NOTE:

Lubrication **When lubricating, refer to Section 3.5 of this Service Handbook.**





P/N 50805101 Lever: Change RSPL Both B.2.05

P/N 51228201 Gear: Idle RSPL Both B.2.05

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3.2.24 Pressure Spring

1. Perform these procedures: **3.2.01, 3.2.06, 3.2.07, 3.2.16, 3.2.17, 3.2.19, 3.2.20, 3.2.22, and 3.2.23.**
2. Turn the front release gear arm (1) until it is disengaged.
3. Remove the release cam (2). This is the medium size, thick cam.
4. Work the end of the pressure spring (3) free and remove the spring.
5. Remove the front release gear arm. This arm is long, with a serrated edge.
6. Remove the switch lever (4). This is the small lever.

NOTE:

Installation

Install the release cam first.

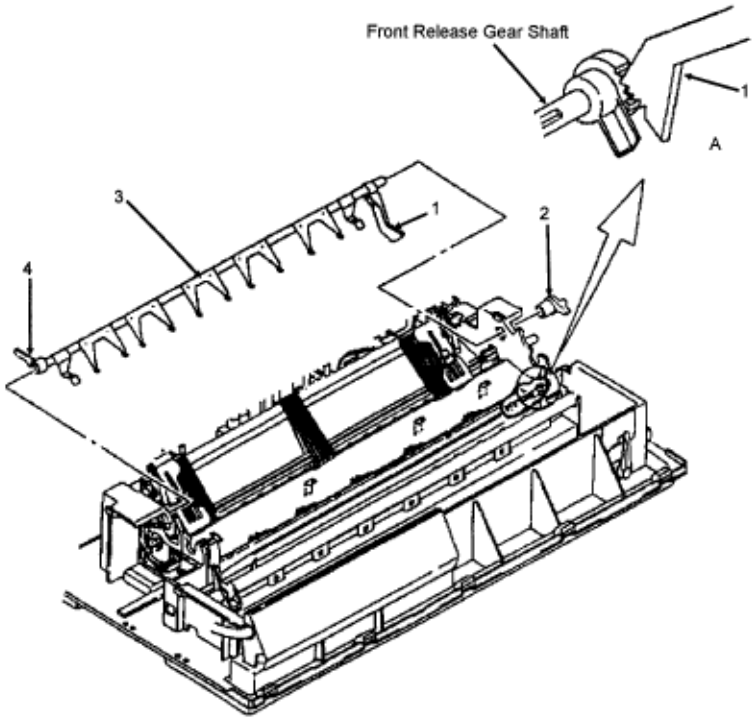
Then, install one end of the pressure spring into the release cam.

Slide the cam and spring away from the base frame until the opposite end of the spring can be installed into the frame.

Make sure that the front release gear arm is engaged as shown (A).

Lubrication

When lubricating, refer to Section 3.5 of this Service Handbook.



P/N 50805201 Lever: Switch RSPL Both B.2.06

P/N 50805301 Cam: Release RSPL Both B.2.05

P/N 50923301 Spring: Pressure (Narrow) RSPL 520 B.2.06

P/N 50923401 Spring: Pressure (Wide) RSPL 521 B.2.06

P/N 51228301 Arm: Front Release Gear RSPL Both B.2.06

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3.2.25 Carriage Shaft

CAUTION

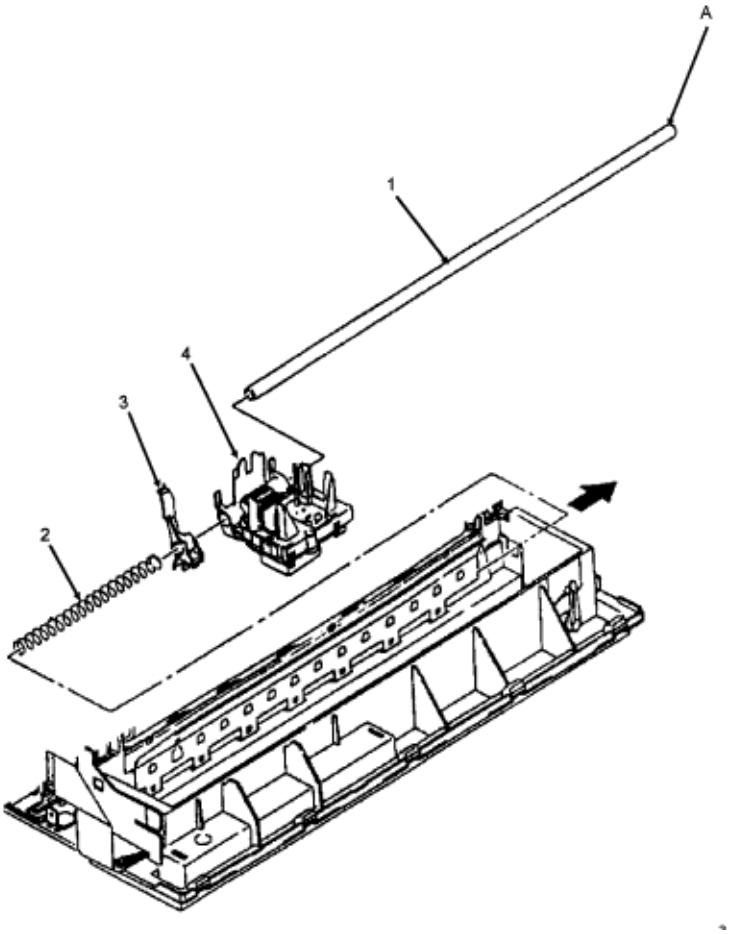
The space motor assembly, etc. may be left in place when removing the carriage shaft. However, use extra care when doing so.

The carriage cable should be detached from the space motor before removing the carriage shaft.

1. Perform these procedures: **3.2.01, 3.2.06, 3.2.07, and 3.2.16.**
2. Push the end (A) of the carriage shaft (1) until it clears the base frame.
3. Pull the carriage shaft free of the base frame.
4. Remove the support protect reset spring (2).
5. Remove the support protector assembly (3).
6. Remove the frame set carriage (4).

NOTE:

Installation After installing the carriage shaft, check the printhead gap adjustment. **Refer to Section 3.3 of this Service Handbook. *Cleaning* When cleaning, refer to Section 3.4 of this Service Handbook. *Lubrication* When lubricating, refer to Section 3.5 of this Service Handbook.**



P/N 50098901 Carriage: Frame Set RSPL Both B.2.07

P/N 50923601 Spring: Support Protect Reset RSPL Both B.2.04

P/N 53067601 Protector: Support (Assembly) RSPL Both B.2.04

P/N 53563501 Shaft: Carriage (Narrow) RSPL 520 B.2.04

P/N 53563502 Shaft: Carriage (Wide) RSPL 521 B.2.04

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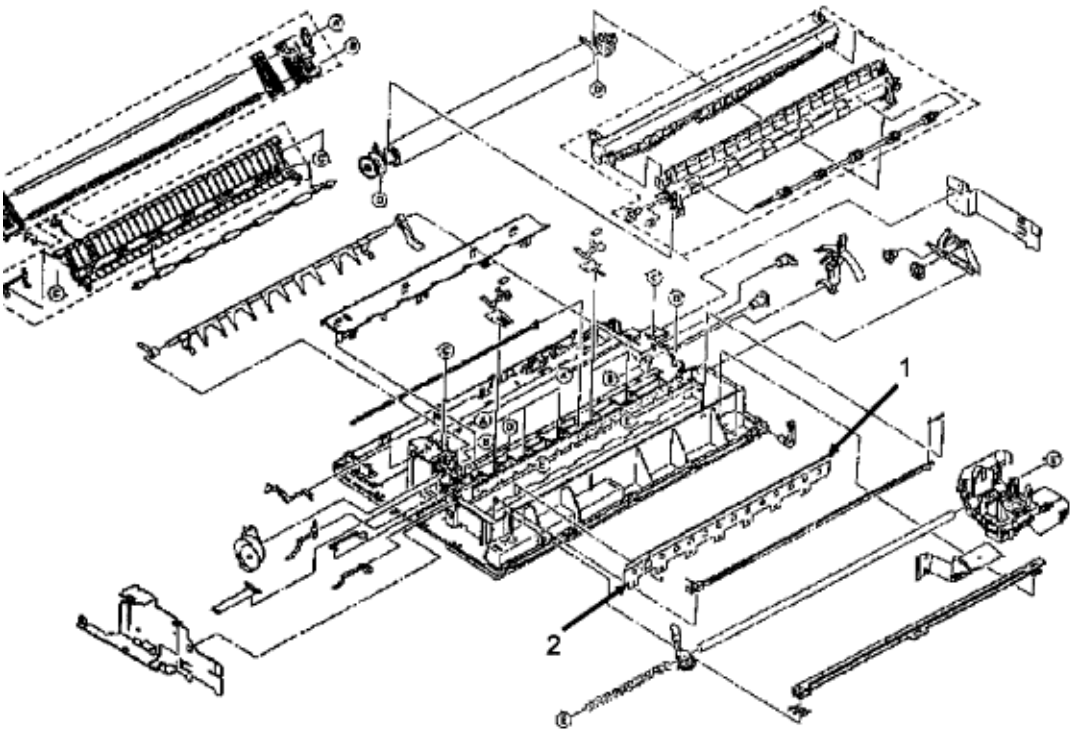
3.2.26 Leaf Spring

1. Perform these procedures: 3.2.01, 3.2.06, 3.2.07, 3.2.16, and 3.2.25.
2. Position the unit so you can access the top and bottom of the leaf spring (1).
3. Start at one end of the spring.
4. Use a straight slot screwdriver to release the bottom extension (2) from the claw of the base frame.
5. Pull the spring up to release the top of the spring from the upper claw.
6. Repeat the above two steps, working towards the opposite end of the spring.
7. Remove the spring.



P/N 50923001 Spring: Leaf (Narrow) RSPL 520 B.2.04

P/N 50923101 Spring: Leaf (Wide) RSPL 521 B.2.04

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